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Lubrication ENGINEERING

CONVENTION ISSUE

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APRIL 10, 11, 12, 1950
HOTEL STATLER, DETROIT

JOURNAL OF THE AMERICAN SOCIETY OF LUBRICATION ENGINEERS

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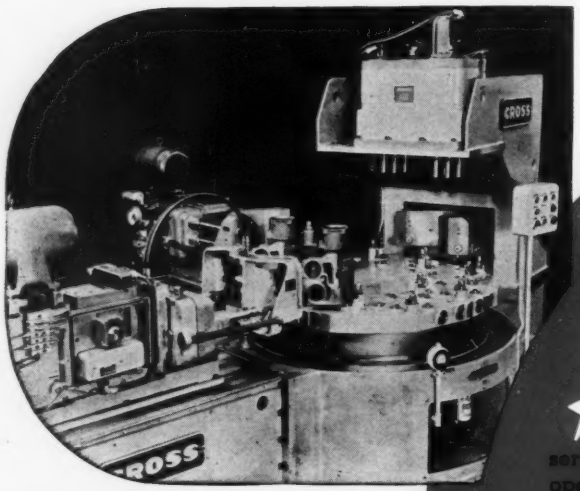
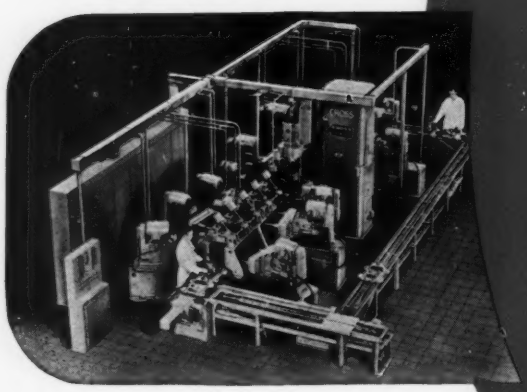
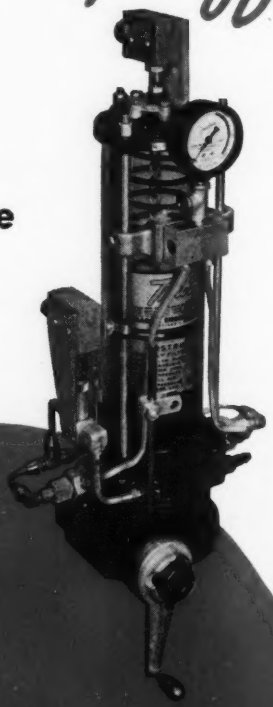
TRABON AUTOMATIC LUBRICATION

Used By Leading Auto Manufacturer

on new *Automatic* transmission line







More than 120 points of lubrication are served by a Trabon automatic system on this operation — The Transfer-Matic machine manufactured by Cross Company of Detroit — where precisionlike workmanship requires positive lubrication at all times.

Trabon systems are widely used in the automotive industry. Trabon systems make it impossible to skip or underlubricate a bearing or gear...Trabon systems need only one indicator at the pump . . . are completely sealed with no exposed moving parts . . . dirt, dust, moisture, abrasive grit — all are barred from a Trabon lubricating system.

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Reduces Cost of Machining Spindle Gears by 50%

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On the spindle broaching operation, done prior to barbing, this same Stuart product is performing with excellent results. The spindles are C1117 steel, hardness 83 on the Rockwell B scale.

On standard or special operations you will find that Stuart cutting fluids plus Stuart service are the combination that will reduce your costs. Ask for literature.

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Lubrication ENGINEERING

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Official Publication of the American Society of Lubrication Engineers
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Northwestern Technological Institute, Evanston, Ill.

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Production Report No. 261 shows increases of 400 pieces per tool grind on drilling and reaming bolt holes on connecting rods.

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An inquiry on your letterhead will bring a skilled process engineer into your plant for any production increase tests you may wish to run.

THERM-O-COOL . . . *a precision grinding fluid is recommended for troublesome grinding operations.*

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The HOUGHTON LINE NEWS

REG. U.S. PAT. OFF.

Published by E. F. Houghton & Co., pioneers in heat treating and metal processing products since 1865

VOL. 18, NO. 2 APRIL, 1950

...the "near editor's" viewpoint...

Retirement of men at age 65 proved to be a controversial subject, many declaring it is a real social waste. One reason brought forward for today's longer span of life is that we have to live longer to earn enough to pay our taxes.

Since the pendulum swung back from state socialism to free enterprise in Australia, most Conservatives expect to see business improve almost overnight. But the dollar shortage cannot be overcome that rapidly, and that is the fundamental economic problem "down under."

And from Australia comes the item about an old grandfather who was given a new boomerang and spent the rest of his life trying to throw the old one away.

Aaron Hamilton

CHAIRMAN OF THE BOARD.

Hot-Spot Lubrication

In building a new all-inclusive series of lubricants to withstand high heat conditions, one step has been to change over two of our well known oils to this brand, without altering them in any way. They are Core Oven Conveyor Oil (now to be Hi-Temp Oil 102) and Enameling Conveyor Oil (now Hi-Temp Oil 101).

In addition we have the standard Hi-Temp 200 series comprising three oils of varying viscosities. No. 227 is the biggest seller, being used for lubricating trolleys and conveyors in kilns, ovens, vulcanizers and heat treating plants. It will keep lubricating after the hydrocarbon portion finally oxidizes; bearings won't freeze up.

Watch for news of entirely new high-temperature oil developments soon. Meanwhile if you have a hot-spot lube problem, circle C in the coupon.

Photo courtesy Baldwin Loco. Works

Applying Houghton's Cosmoline to exposed moving surfaces of engines to be shipped to India, to prevent corrosion during long ocean voyage. They arrived in perfect condition.

Now, no need to STOP machines to clean them

One of the secrets of Houghton's success in hydraulics is knowing how to clean out machines when installing a fresh charge of hydraulic oil.

In the early days of hydraulics it was necessary to take a machine out of production to clean out lines and reservoirs. Now, however, it can be purged without losing an hour's productive time.

All you have to do is add GUM SOLVENT "B" to the system, using 5% of the hydraulic oil capacity. Then keep on operating the machine in normal production from 100 to not more than 150 hours, giving the solvent time to dissolve gums and sludges.

Then drain the system and install new hydraulic oil — preferably our HYDRO-DRIVE for long, trouble-free service.

Gum Solvent "B" is in its eighth year as a trouble-shooter. We have recently enhanced its properties still further by incorporating a special emulsifying agent in it, to take watery sludges into solution. Of course, if there is a considerable excess of water in the system, the solvent won't take it all into solution, but when draining, the water not included in sludge deposits will automatically be removed.

You can also use Gum Solvent "B" for other cleaning purposes around the shop, such as flushing headstocks, gear boxes and all oil reservoirs, and for soaking dirty parts on which oxidized oil deposits have formed. We suggest you keep a drum on hand at all times. Circle A in the coupon below for prices and full data.

Never Turned Down

One of the heartening things about supplying a better hydraulic oil is that while people may not beat a path to your door, they do recognize the qualities of such an oil and will approve it after we've explained and proved its merits.

We have never been refused an approval on our HYDRO-DRIVE oil. True, some machine tool and press manufacturers maintain a policy of not approving an oil by brand name, but those who do, unanimously accept Hydro-Drive. And others who deal in specifications only, find that this oil meets their "specs" in every respect.

It's a high-V.I. product, the pioneer of treated hydraulic oils. We start with a high quality stock and fortify it for hydraulic service by treatments which enhance its oxidation stability, its power to take gums into solution, its rust protection and its film strength. Only the manufacturer of the oil is equipped to provide such a four-way treatment; it's not a simple additive job. One of the largest pump manufacturers who formerly did not favor treated oils came out last year in favor of oil addition agents, but warned that such agents "should be incorporated by the oil manufacturer only, as otherwise serious trouble may result."

There's a free Handbook available which contains basic hydraulic operating data. Circle B on coupon.

One Grease Is Enough

It isn't necessary to use three or four different greases in the ordinary plant, now that an all-purpose grease of unusual versatility is available.

We refer to Houghton's STA-PUT 18-H, a mixed base (soda-aluminum) grease which will withstand fairly high heat and moderate moisture conditions. It may be used without separation danger in pressure lubricating systems and will do an excellent job wherever grease lubrication is required. It is of No. 1 consistency; for a heavier grade, use Sta-Put 18-H2, also O. K. for grease dispensing equipment. For Data Sheet, circle D on the coupon.

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1. Houghton's Engineered Lubrication Plan folder—describes personalized plant service.

2. HOUGHTO-SOLV, fuel oil additive which takes sludge into solution rapidly. (6-page folder.)

3. ANTISEP All-Purpose Base—new-type cutting base, water-soluble, will handle 90% of all your machining needs. (4-page folder.)

4. Hydraulic Packing Standards handbook for VIM Leather and Vix-Syn packings supplied by our Hydraulic Dept. (32 pages.)

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♥ You'll get better production when you make jobs better with Cimcool. Let a demonstration in one of your own machines convince you. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you. Or, if you prefer, send for our free booklet "CIMCOOL Gives the Answers." Address, Sales Manager, CIMCOOL Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

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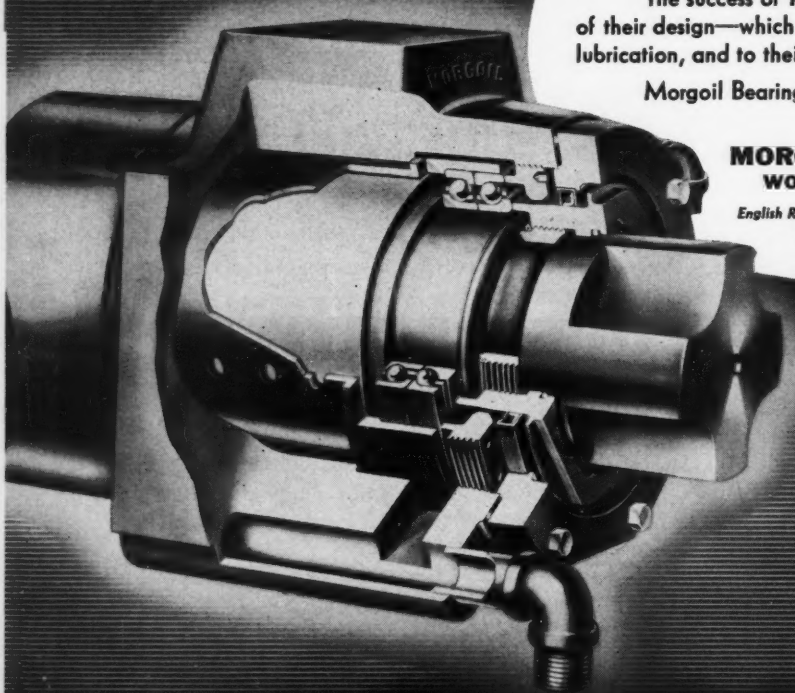

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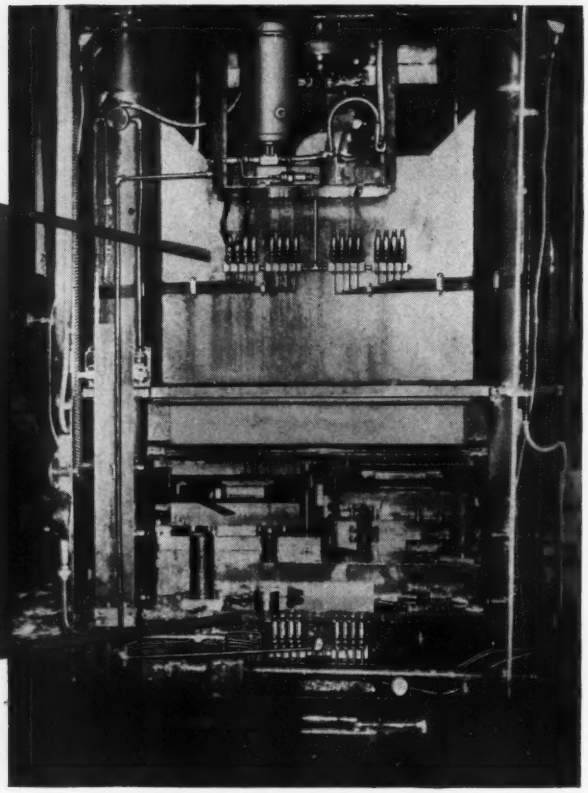

350-ton Hydraulic Draw Press

The Problem: "Four years ago, we purchased a 350-ton hydraulically operated draw press. After only a few weeks operation, we were forced to tear this press down and scrape the ways of the bed cushion. After a few more weeks of operation, the bearings on the guide posts for upper ram started galling, causing another shutdown and re-machining operation.

Solution: "Then we decided to install a Lincoln Centro-Matic* Lubrication System.

Results: "A year later, we purchased a similar press of 550-ton capacity on which we installed a Lincoln Centro-Matic Lubrication System. We did this before operating the press with the result that we have never had to do any work on ways or guide posts of this press.

"Our next installation was on an hydraulically operated bending machine used for forming outer shell of the refrigerator. After ways on this machine started to score, we were obliged to shut down while we did extensive scraping of the ways. Needless to say, we immediately installed our third Lincoln Lubrication System, with the same satisfying results."

WM. S. DRAPER, Maintenance Division
Norge Division, Borg-Warner Corporation

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Lincoln's Lubrication System specialists will work with you and recommend the time and money saving Centralized Lubrication System best suited to your equipment. Phone or write

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"dag" colloidal graphite is unique in its combination of properties and uses. It is very slippery and extremely durable, anti-corrosive, gas adsorbent, chemically inert and, of course, highly resistant to heat.

In deep piercing you get smooth forgings, close tolerances and reduced wear on dies. In casting and mold stripping you get smooth surfaces, clean parting, fewer rejects; and additional mold life.

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Brass, bronze, aluminum, magnesium, carbon steel and stainless steel . . . wherever your fabrication problems are friction and heat . . . **"dag"** colloidal graphite reduces the one and resists the other.

The NEW Acheson Bulletin #426 on the Use of **"dag"** Colloidal Graphite in Metalworking operations is just off the press . . . a copy is ready for you if you will fill in and mail the coupon.

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Acheson Colloids is equipped to do custom disintegrating, dispersing, and stabilizing of solids in a wide variety of vehicles. If you are in need of this type of service, tell us about it. We may be able to help you.

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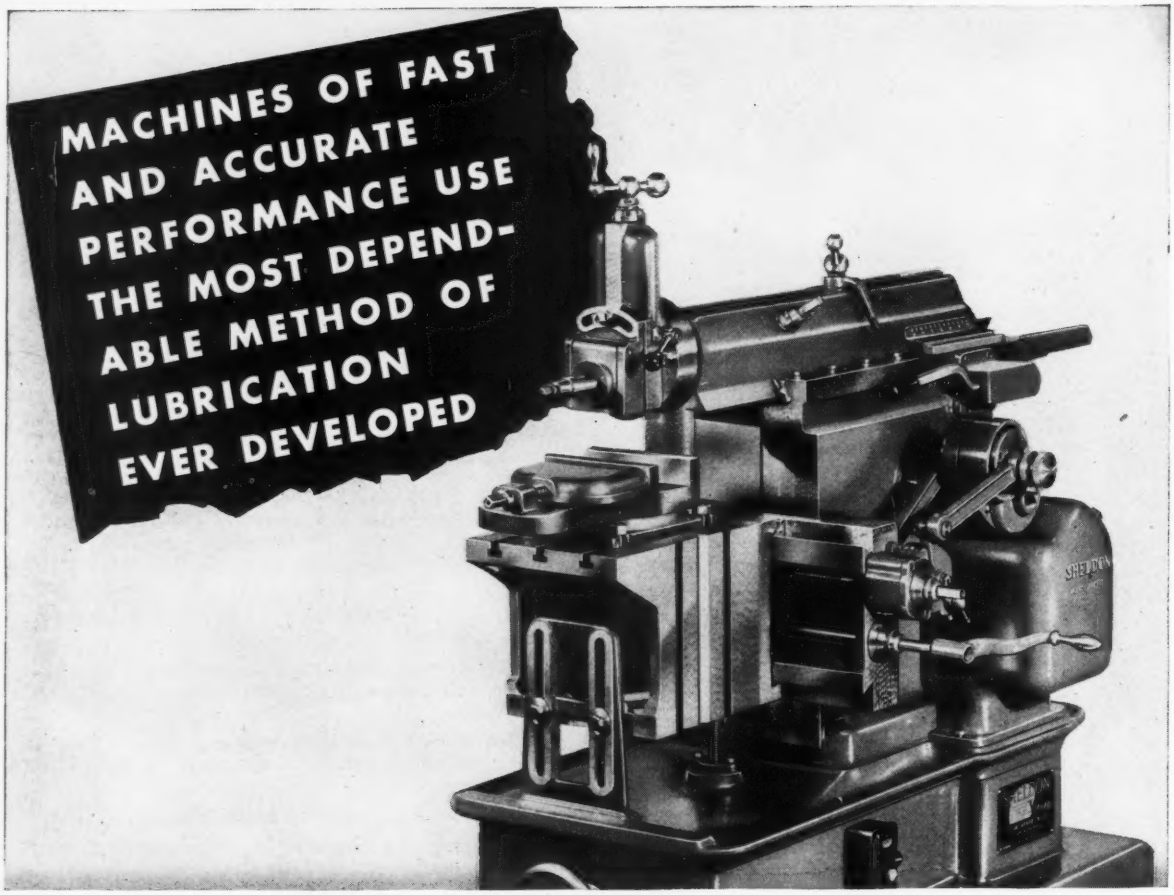
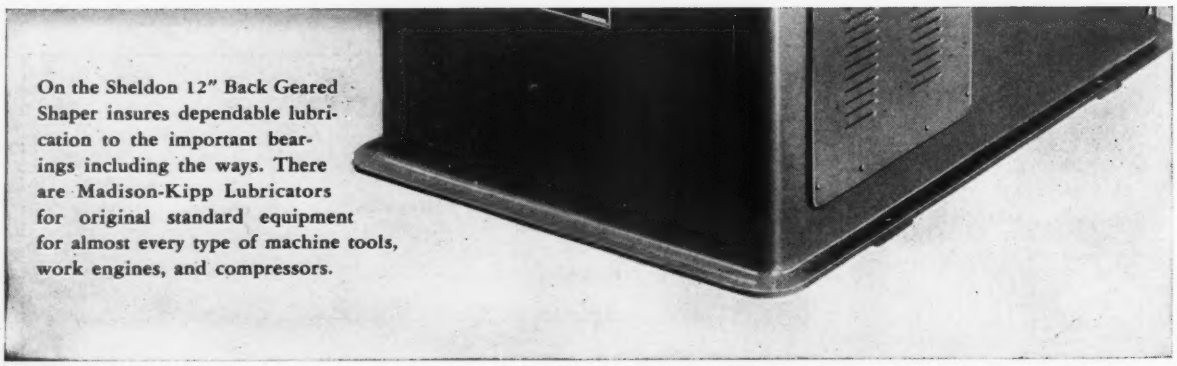


MADISON-KIPP *Fresh Oil* BY THE MEASURED DROP



On the Sheldon 12" Back Geared Shaper insures dependable lubrication to the important bearings including the ways. There are Madison-Kipp Lubricators for original standard equipment for almost every type of machine tools, work engines, and compressors.

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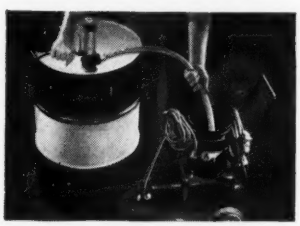
"Treasure hunting" for ways to cut production costs, a leading Philadelphia manufacturer* called in one of our Alemite Lubrication Engineers. His presentation of how to save through more efficient lubrication was timed to take 5 minutes. But it led to the adoption of new methods that are saving the company $9600 a year!

An Alemite System was planned and installed, and immediately began to effect savings three ways: 1. Saving $4.60 per day for labor in lubricating the machines. 2. Cutting bearing failures and replacement costs to the bone. 3. Eliminating "down-time" for lubrication that resulted in $40 worth of added production per day.

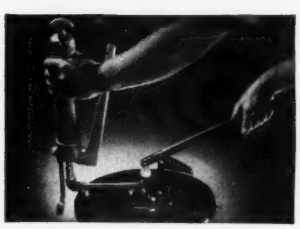
No matter what size or type of plant you operate, Alemite can show you dozens of examples of worthwhile savings through more efficient handling of petroleum products. These are facts which you can readily confirm in your own time studies. Contact your local Alemite Industrial Distributor now. Or send for free booklet "11 Ways to Cut Production Costs." Simply attach coupon below to your letterhead. Alemite, Dept. P-40, 1850 Diversey Parkway, Chicago 14, Ill.

*Name on request

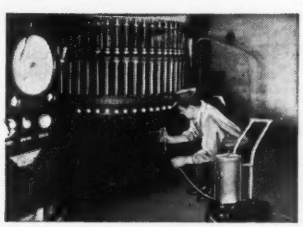
Alemite Cuts Costs 3 Ways



1. ***In Transferring Lubricants...*** by eliminating mess, expensive contamination—and cutting man hours 63% for every 100 pounds of lubricant transferred.



2. ***In Loading Grease Guns . . .*** by saving 3¾ man hours for every 100 pounds of lubricant loaded into hand guns.



3. ***In Applying Lubricants . . .*** by saving up to 23.9 man hours for every 100 pounds of lubricant applied to bearings.

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MEANS EVERYTHING FOR LUBRICATION

1. Methods 2. Lubricants 3. Equipment

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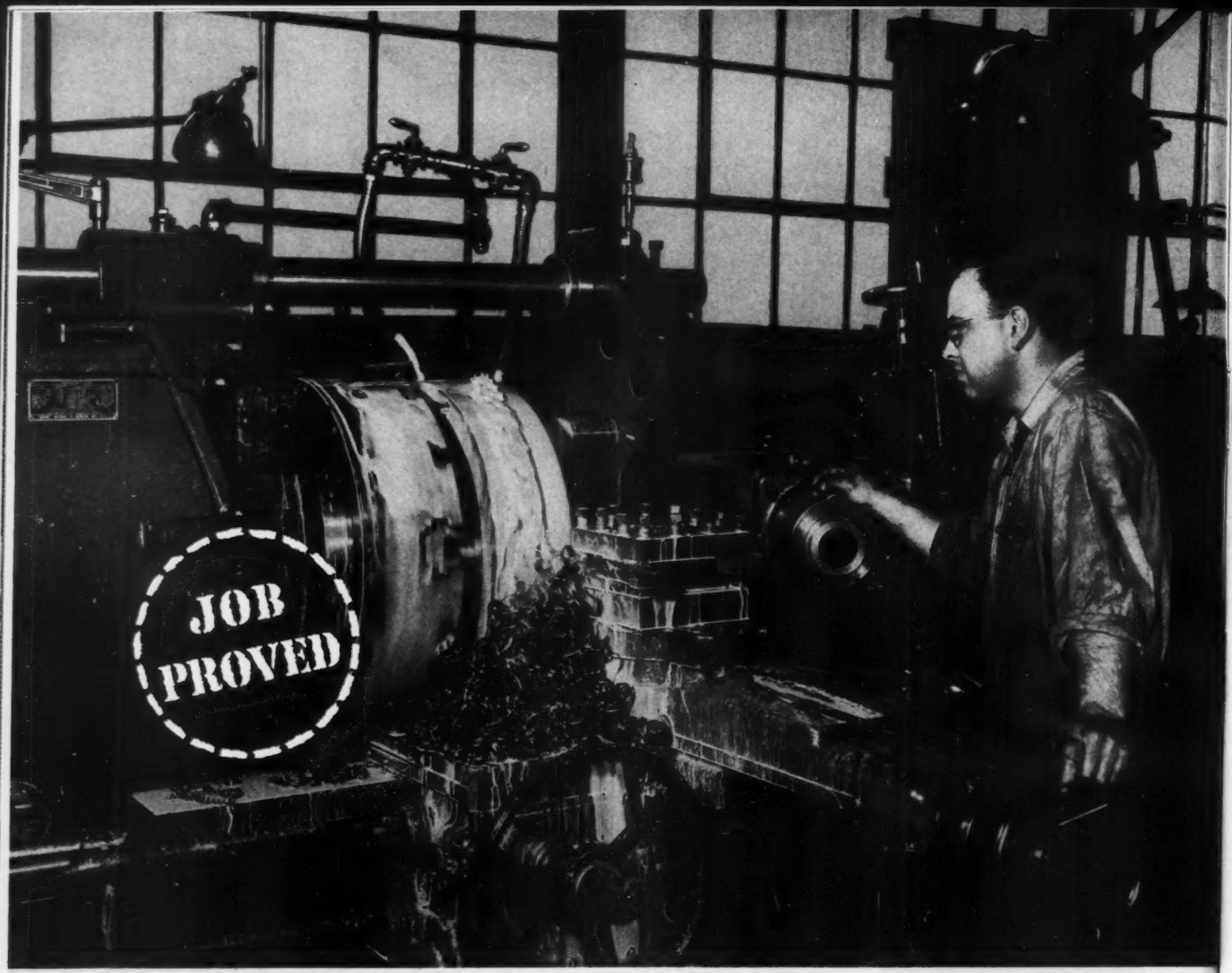

S.E.C.O. BEATS COSTLIER CUTTING OIL

Competitive Product Fails to Match Fine Record of Sunoco Emulsifying Cutting Oil in Cost or Performance

For 27 years a metalworking shop used Sunoco Emulsifying Cutting Oil with complete satisfaction on difficult operations. The following is a typical example:

Machine: Gisholt turret lathe, model 4L.
Part: 20" press mold shell 22⅝" O.D. x 6" wide x 20½" I.D.
Operation: Turning, boring rough forgings.
Material: 40-50 carbon steel.
Tools: Firthite carbide tools.
Feed: .012 at 31 rpm.
Cut: ½" to ¾" on O.D. and boring.

Tool life was excellent. Machines stayed clean. High production, with minimum scrap, was the rule year in and year out.

Two years ago the shop was persuaded to try a competitive oil on the above operation. Test results showed that the competitive oil, costing three times as much, lacked stability. Performance was far inferior to that of Sunoco Emulsifying Cutting Oil in regard to tool life and quality of finish. The company was quickly convinced that its original choice had been sound.

In all machine shop operations, on both ferrous and nonferrous metals, you'll find Sunoco Emulsifying Cutting Oil and Sunicut* straight cutting oils of real assistance. They help maintain production schedules, lengthen tool life, and keep operating costs down. For a free Sun cutting oil recommendation card, write Dept. L-4.

*Sunicut is a trademark of Sun Oil Company

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"JOB PROVED" IN EVERY INDUSTRY

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THE EDITOR'S PAGE

ASLE Convention and Exhibit

To the society at this time, by far the most important event on the horizon is the convention and exhibit. This year Detroit is the host city and the Hotel Statler houses both the show and the convention, with April 10, 11 and 12 the big days. The program committee, headed by Dr. William H. Millett, as always has arranged a fine program with a group of papers covering the whole gamut of the industry from lubrication practice to theoretical research. Two popular-type symposia are scheduled in addition to the individual papers. One of these is a forum on plant-lubrication-engineering practice at which Mr. L. A. Danse of General Motors will preside. No less significant is the symposium on oil reclaiming. This highly controversial subject should hold the attention of a large audience. The exhibit and show which will be held at the hotel is the largest ever attempted by the society and advance notices on the quality and variety of the exhibits bid fair to making this all-lubrication exhibit a standout.

New Bearing-Test Machine

A heavy-duty bearing-testing machine has been described by its developer, Earl J. Clark, in the February fifteenth issue of *Automotive Industries*. This machine is unique in many ways, as among other things it can load a bearing to more than 34,000 pounds by use of the proper centrifugal weights and do this at journal speeds up to 4,200 rpm. Although the author built the machine primarily for testing heavy-duty aircraft-engine bearings, there is no reason why its general design would not be suitable for many other types of bearings. A description is given in the article for a contact-button arrangement to serve a thermocouple for measuring bearing temperatures. This is practically as effective as the less flexible arrangement in which the couple is soldered to the bearing shell. Fatigue life and seizure resistance can easily be determined for a variety of materials with the test set up. In addition to this, provision can readily be made for finding the relative tolerance of bearings to foreign matter in the lubrication oil. Test results are not given in this paper but we hope we can look forward to a follow-up paper with Mr. Clark giving the results on a variety of bearing materials.

Jet Engine

Recent comment on this page called attention to the trend away from the reciprocating engine as the power source for high-speed aeroplanes of a military nature. Particularly significant in this connection is the information which has just been released for publication that Pratt and Whitney has developed a jet engine capable of producing 11,000 thrust horsepower. The unit is the J-48 and is now being tested on several fighter-type planes. Development of 11,000 horsepower in a unit 50 inches in diameter, 105 inches long and weighing less than a ton has been accomplished in the J-48. This represents 5 horsepower per pound of weight in contrast to the one horsepower per pound of weight associated with reciprocating engines. This one unit develops as much power as the four engines of the large war-time bombers.

Data on fuel consumption are not yet available but it is necessarily true that fuel consumption will be high and offset some of the weight saving in the engine itself. The price of high speeds, above 600 miles per hour and into the supersonic range, reaching toward 1,000 miles per hour, is terrific but military preparedness says the bill must be paid and developments will continue. Such developments, however, have already made significant contributions to peace-time progress and will continue to do so. It goes, too, without saying that none of these developments would be at all possible if bearing design and lubrication methods had not kept abreast of power and aerodynamic progress. Some such design problems for lightly-loaded, high-speed bearings have already been considered in the pages of LUBRICATION ENGINEERING.

Stream Pollution

At first glance this topic appears to be out of place for LUBRICATION ENGINEERING but sadly enough this is far from being the case as our engineers more and more will have to struggle with control of lubricating and cutting oil wastes. The days of handling the problem of unwanted wastes by sending them down the sewer or directly into a nearby stream are no more; as civic, state and federal regulations are becoming justifiably more coercive. In particular, emulsions used in connection with metal cutting, produce liquid wastes some of which are very difficult to handle as they can be extremely resistant to separation. When waste products exist in large quantity, the problem becomes magnified to alarming proportions. At the last meeting of the Board of Directors of A.S.L.E. it was decided to appoint a committee to study various aspects of the problem of waste disposal. When we add to the industrial waste-disposal problem the difficulty connected with handling chemical and biological wastes, we realize that we have before us one of the most difficult problems facing industry and the attention of the best research minds should be focused upon improvement of this difficult situation.

B. H. JENNINGS

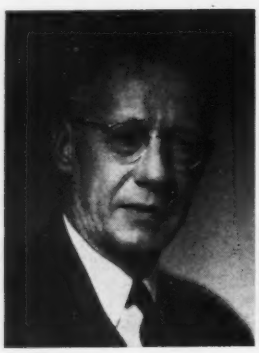
authors of papers fifth ASLE convention

E. M. KIPP

D. M. CLEAVELAND

W. E. CAMPBELL

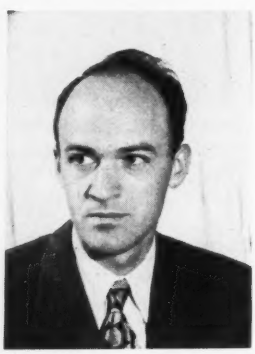
E. R. HARRIS



C. E. SCHMITZ

E. S. ROSS

C. M. ALLEN



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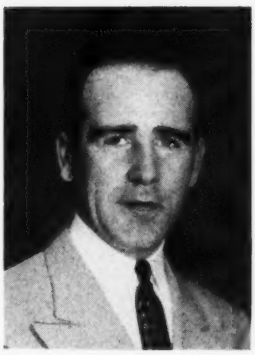

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abstracts—convention papers

The following abstracts of the papers to be presented at the 1950 Annual Convention of A.S.L.E. are published herewith for general information and to stimulate discussion at the meeting. They do not necessarily represent the final opinion of the authors and are subject to revision when the full papers are formally published.

MULTI-FUNCTIONAL LUBRICANTS

BY E. M. KIPP,
Chief of Lubricants Division, Aluminum Company of America.

The application of multi-functional lubricants is discussed briefly from several points of view. It is indicated that multi-functional lubricants can serve a useful purpose in the consolidation of lubricant items for many applications with resultant benefits for both the consumer of lubricants and the manufacturer or vendor of these products. The large number of presently available commercial lubricants is criticized on the basis that specific need for relatively secondary corresponding variations in properties has not been clearly established. Attention is also called to the fact that variations in operating conditions may often be of such magnitude as to throw the use of lubricants of a highly specific nature open to considerable question on the basis of practical realities. It is suggested that the use of multi-functional lubricants merits careful consideration, and that in this regard, over-all costs rather than initial costs of lubricant only should be controlling.

MECHANICAL SEALS AND THEIR RELATIONSHIP TO GOOD LUBRICATION PRACTICE

By C. E. SCHMITZ
Vice President and Director of Engineering, Crane Packing Company, Chicago, Illinois.

This paper deals with the importance of the mechanical seal in good lubrication practice. The following aspects are discussed:

1. Loss of lubrication.
2. Contamination of lubricant.
3. Damage to product caused by oil leakage.
4. "Housekeeping" difficulties of cleaning up oil leakage.
5. Fire hazard.
6. Improved mechanical efficiency by utilizing better suited lubricants.

Important design considerations in the construction of good mechanical seals are also discussed and shown by means of slides which supplement this paper.

MAINTENANCE OF HYDRAULIC SYSTEMS

BY M. A. HAYDEN
Assistant Sales Manager, Vickers, Inc., Detroit, Michigan.

There are at least three requisites for a good hydraulic system in a machine tool:

1. The manufacturer of the hydraulic equipment must provide adequate design, good workmanship and conservative rating in the hydraulic units.
2. The machine tool builder must apply the hydraulic units correctly, and combine the individual units into a hydraulic circuit which meets the performance requirements of the machine.
3. The user must employ a good hydraulic oil, operate the system within its limitations, and use qualified people to systematically maintain the equipment.

A recent analysis indicates that 95 per cent of the service problems with hydraulic systems of machine tools are within the control of the user. These problems can be eliminated by cooperation among the hydraulic equipment manufacturer, the machine tool builder and the user, for the purpose of instructing maintenance men in basic hydraulics as applied to the equipment they maintain. Ample educational material for training maintenance men in hydraulics is now available. The user can make the largest contribution to his own satisfaction with hydraulic systems by recognizing his need for qualified hydraulic maintenance men and acting on this need.

RECLAIMING INDUSTRIAL PETROLEUM PRODUCTS

BY D. M. CLEAVELAND
Lubrication Engineer, Bendix Products Division, Bendix Aviation Corporation, South Bend, Indiana.

The reclaiming of cutting oils, some lubricating oils, and solvents as practiced at Bendix Products Division, Bendix Aviation Corporation is discussed. Materials that become contaminated to such a degree that they can no longer be used are processed or reconditioned so that they may satisfactorily perform their original function, if their reclaiming is economically feasible.

This practice conserves valuable materials and, in the case of cutting oils, tends to control skin trouble among machine operators.

Contaminants fall roughly into four classifications, namely:

1. Insoluble materials.
2. Volatile impurities.
3. Colloidal impurities.
4. Substances soluble in oils.

The first three tpyes are of principal concern. In general, filtration is used for removal of contaminants falling in the first classification, distillation for those falling in the second classification, and filtration and chemical treatment for the third classification.

The above processes will be explained rather briefly by the use of slides and flow sheets.

OIL MIST LUBRICATION

BY E. R. HARRIS
Manager of Industrial Sales, Alemite Division, Stewart-Warner Corporation, Chicago, Illinois.

Oil mist lubrication is a completely new idea in the science of lubrication of machinery bearings. The oil mist system is simple, compact, and lends itself to modern machinery design. It consists of a lubricator that atomizes oil through air pressure and delivers oil mist to a group of bearings on a machine. This atomization

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breaks the oil down into microscopic particles as fine as a wisp of smoke. Bearings in this oily atmosphere are lubricated and ventilated by a constant film of fresh oil. In actual production experience, this system has cut oil consumption as much as 90 per cent. The precision production of grinding machines has been greatly improved and bearing life has been increased from 400 to 7,000 hours.

THE APPLICATION OF WEAR RESISTANT PHOSPHATE COATINGS TO FERROUS SURFACES

BY M. B. ROOSA
Assistant Sales Manager, Parker Rust Proof Company, Detroit, Michigan.

The application of phosphate coatings to ferrous surfaces, combined with well engineered lubrication, is accepted today as a proven method for reducing wear and galling on mating parts. The wear resistant phosphate coating is produced by chemical immersion of the properly cleaned parts in a bath of metal acid phosphates containing free phosphoric acid and accelerating media. The type of coating and degree of etch depend in large part on the cleaning method used prior to treatment. The non-metallic and oil adsorptive characteristics of the crystalline coating prove highly beneficial on bearing surfaces through the prevention of "welding," increase in lubrication efficiency, and assurance of rapid and safe break-in. The automotive, aircraft and diesel engine field offer many practical applications for phosphate coatings where wear is a problem. The overall saving to be effected by changes in manufacturing procedure and elimination of field failures is a point of principal interest to manufacturers. This treatment provides the mechanical, automotive and lubrication engineer an economical means for assuring a product of maximum quality and life service.

THE LUBRICATION OF SLIDING ELECTRICAL CONTACTS

BY W. E. CAMPBELL
Research Department, Bell Telephone Laboratories, Murray Hill, New Jersey.

Ideally, a lubricant for sliding electrical contacts should prevent wear, protect the metal against corrosion films which raise the contact resistance, and disperse wear products and atmospheric dust which may tend to compact in craters on the surface and raise contact resistance. The present paper presents the results of wear, friction and contact resistance studies made on phosphor bronze—brass, phosphor bronze—silver, brass-silver, and silver-silver, contact combinations, lubricated and unlubricated, under test conditions closely simulating actual operation.

For the base metal combination, it is found that contact resistance invariably increases rapidly for lubricated contacts, especially if lubricant application is sparing, while friction is low and wear rate small. With clean, unlubricated surfaces contact resistance is low and uniform, but wear and friction are very high. For silver on silver, friction, wear, and contact resistance remain low. This is also true when silver is operated against phosphor bronze or brass, and examination of the surfaces shows that silver is transferred to the base metal surface. These results are discussed in the light of the modern theory of boundary lubrication, with which they are in complete accord.

Successful contact lubricants which have been developed for base metal contacts strike a compromise between maintenance of freedom from wear and low contact operation, being a dispersion of a small amount of a very fine abrasive by means of a detergent in a mixture of white oil and petrolatum.

A description of methods used for applying lubricant to banks of telephone contacts will be given.

LUBRICATING OILS IN REFRIGERATION

BY E. S. ROSS
Special Representative, Industrial Products Division, Sun Oil Company, Philadelphia, Pennsylvania.

Following a brief discussion of petroleum as the basic source of lubricating oils, this paper presents descriptions of the processes employed to separate the lubricating oil constituents and their recovery as distillates of varying viscosities. The constitution of lubricating oil distillates is also discussed, followed by a description of the methods employed to "purify" or "refine" these distillates to meet predetermined or specified tests. The importance of certain essential properties and the significance of specified tests is discussed as being of prime interest to the ultimate user of finished lubricating oils. The more important uses for lubricating oils are tabulated. The specific selection of most suitable products for the lubrication of refrigeration compressors is discussed. In this connection, the most essential quality requirements for such use are pointed out, oil-refrigerant relationships are reviewed, and most of the controversial subjects connected with selection of suitable oils are discussed.

The paper concludes with a final discussion of lubricating systems, equipment and applications.

FRICTION AND WEAR OF BEARING MATERIALS CONTAINING MOLYBDENUM DISULFIDE

BY R. L. JOHNSON, M. A. SWIKERT and E. E. BISSON
National Advisory Committee for Aeronautics, Cleveland, Ohio.

A friction and wear study was made of hot-pressed bearing materials composed of various amounts of molybdenum disulfide (up to 35 per cent), silver and 5 per cent copper. Running against a rotating mild steel disk, cylindrical rider specimens made of these materials were found to be lubricated by a transfer of the solid lubricant (MoS_2) from within the structure of the rider to the interface between rider and slider. Surface welding occurred with specimens containing less than 5 per cent MoS_2. The most effective material studied from the standpoint of both friction and wear contained 10 per cent MoS_2. This composition showed the lowest rate of wear and relatively low friction; the friction for this material was relatively unaffected by sliding velocity.

STUDIES OF THE LOAD CARRYING CAPACITY OF SLEEVE BEARINGS

BY C. M. ALLEN and K. A. DAVIS
Research Engineers, Battelle Memorial Institute, Columbus, Ohio.

Rather striking and unanticipated results have been obtained in recent work on the load-carrying capacity of sleeve bearings. The tests included both good and poor bearing materials but the difference in load-carrying capacity was not evident. The order of magnitude of the loads was 10,000 p.s.i. The most obvious explanation for this anomally is that the bearings were

tested under nearly ideal physical conditions. As compared with practical service conditions, these bearings with their test shafts have truer and finer surfaces, are self-aligning, and operate with a cleaner lubricant. It is shown that the load-carrying capacity of a bearing depends upon the susceptability of the material to the imperfections in operating conditions. Upon the removal of these imperfections the relation between performance and type of material is less pronounced. Extensive tests and techniques are described.

LOAD, SPEED AND OPERATING TEMPERATURE OF ROLL NECK BEARINGS

BY J. H. HITCHCOCK,
Director of Research, Morgan Construction Company, Worcester, Massachusetts.

Experimental measurements of bearing load, speed, and operating temperatures were made on a sleeve type roll neck bearing under a variety of conditions in full size field installations. Operating temperatures were measured by installing thermocouples in the bearing metal near the bearing surface, at five positions in the loaded side of each bearing and at the center of the unloaded side. These observations are believed to provide reasonably accurate indication of temperature within the oil film. In general, no important temperature differences are found between the five positions of observation in the loaded side of the bearing; consequently the results offer little clue to the temperature distribution in the loaded area. However, the results provide opportunity for correlation of operating temperature with variations in load, speed, and viscosity and rate of flow in lubricant, within the limited range of experimental conditions. As should be expected, the results indicate that operating temperature increases with load, speed and viscosity, and diminishes with increasing rate of oil flow. The results also suggest that operating temperature is independent of the type of bearing material as long as a condition of complete hydrodynamic lubrication exists.

OIL FLOW IN JOURNAL BEARINGS

BY H. H. GILLESPIE and W. V. SMITH
Bearings Division, Bureau of Ships, Navy Department, Washington, D. C.

A review is presented of the test methods and apparatus employed in an investigation of journal bearings at the U. S. Naval Engineering Experiment Station, Annapolis, Maryland. Observations are reported on the effects of load, speed, inlet pressure and inlet position on the oil flow in journal bearings. Anomalous behavior was observed with increasing loads when the inlet oil position was changed from the converging to the diverging side of the clearance space. When both sides of the clearance were maintained at the same supply pressure, flow into the converging side showed a strong tendency to reverse under high loads. An example of the failure of planetary gear bearings which was ascribed to this flow phenomenon is reported and a qualitative explanation of the effect is offered.

PRELIMINARY NACA RESEARCH ON ROLLER BEARINGS AT HIGH SPEEDS

BY E. F. MACKS and Z. N. NEMETH
National Advisory Committee for Aeronautics, Cleveland, Ohio.

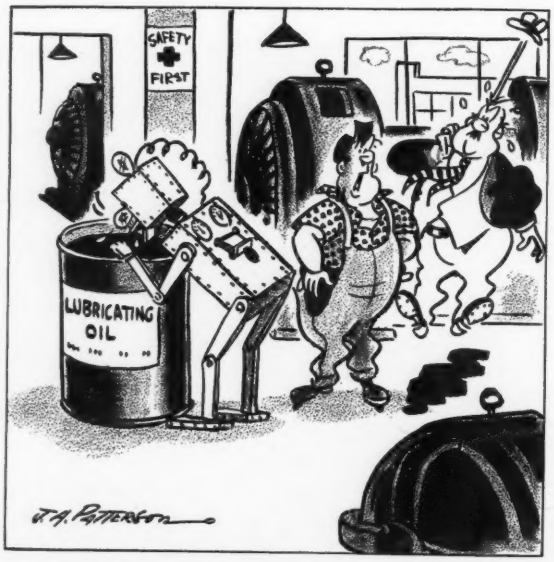
Preliminary studies of aircraft, gas-turbine-engine roller bearings have been conducted, using jet lubrication, at DN values from 0.3×10^6 to 1.65×10^6. Roller-riding and inner-race riding cage-type bearings, which are now used interchangeably in aircraft engines, were found to have significantly different operating characteristics. The effects of oil-inlet temperature, location, angle, velocity, momentum, and distribution on bearing inner-race and outer-race temperatures are evaluated over a wide range of operating conditions. Failures representative of those obtained with different cage-type bearings are analyzed. In order to check the correlation between test rig data and actual engine operating data, a direct comparison of these data for the same bearing was made over a range of DN values from 0.3×10^6 to 0.86×10^6.

Attention

Announcing the second in our series of monographs "Petroleum Type Hydraulic Fluids" by A. J. Zino, Jr. Revised and expanded by our Educational Committee under the direction of Dr. D. D. Fuller, Columbia University. Special publication in the interest of better lubrication. First printing available at our Detroit Convention, April 10-12, 1950, Hotel Statler. Price $1.00 per copy.

Presenting the first of a series of cartoons, which we hope will bring a smile to our readers.

We shall be interested in receiving comments, pro or con.



"What's So Strange — You Get Thirsty, Don't You?"

LUBRICATION SERVICE SYSTEM

LUBRICATION ENGINEERING is pleased to present to its readers, a reprint from *Steel,* November 28, 1949. We feel that this article contains information of importance, based as it is on the results of practical experience. We believe you will agree with our judgment, after you have read it.

by O. M. Albl

Lubrication Engineer
Thompson Products, Inc.
Cleveland, Ohio

ABSTRACT

Based successfully on the idea that lubrication failures can be eliminated if machines are lubricated with the correct lubricant, applied in proper quantity at the right time and in the right way, Tapco's established lubrication department could well serve as a pattern for other metalworking plants.

Correct lubricants are an integral part of any machine. No machine is complete unless lubricants are correctly applied in the proper places, in the required amounts and at the right time. On these premises, Thompson Products Inc., Cleveland, established its planned lubrication service. As a result of efficient functioning of the lubrication department, down time chargeable to this department is under 0.5 per cent on productive hours for over 7 years.

When the present lubrication department was founded, (*Steel*, Aug. 9, 1943, p. 82) a lubrication engineer was appointed. He is also foreman of the group, responsible for the selection of oils, greases, recommendations, system, procedures and management of supervisors and lubrication service men. The foreman is subordinate to a general foreman who is also in charge of the machine repair department. This arrangement eliminates most of the "buck passing" between these departments since they both have the same department head.

A survey was taken to determine what oils were being used in each machine and/or equipment. It was found that at least 40 per cent of the oils in use could be and were eliminated. Samples of the remaining oils were sent to the laboratory for their inspection and approval. Then the official recommendations, for the time being, were made for each machine, with due consideration being given to the major oil suppliers' survey, machine manufacturer's recommendation, and our own past experience.

Changeover Complications—Considerable time was spent in making all the necessary changes that had to be made in order to conform to the recommendations, so each machine had the specified lubricant in all its various parts. Then began the long, tedious job of checking the recommendations. Samples of oils in actual use were taken at specified intervals, the amount of make-up oil that had to be added, and at what frequency it had to be added, was recorded. Temperature readings were taken at intervals, and finally the major supplier made a complete, before-and-after report of specifications, which were submitted to the chemical laboratory. The results were checked here.

This work continued for a period of from 6 to 9 months. Since machines were operating on a three-shift basis, it meant that testing covered a period from 18 to 27 months. Results of all this testing proved that the correct lubricants had been selected and were applied in the right places. This made it possible to set up a definite frequency for each category of lubrication. In setting up frequency changes, we made an allowance for a safety factor which proved, and is proving beneficial, since machines in most cases have been speeded up.

At intervals, further surveys were made by other suppliers and the same testing procedure followed. The result was that all but a few oils passed these tests with varying degrees of success. In testing lubricants, the following factors were taken into consideration: (1) Lubricants must perform satisfactorily in the service for which they are intended, with a minimum of friction and wear. (2) Quality and performance characteristics of each lubricant were evaluated and the oils selected to keep lubrication labor costs at a minimum and to insure minimum interference with production. (3) Lubricating oils for circulation or splash systems must be capable of being reclaimed without loss of service value.

Titles Changed—The names, "oiling department" and "oilers" are not used at Tapco. Instead we have a "lubrication department" and "lubrication service men." We believe this policy should be adopted more universally. This change in titles has resulted in attracting a higher type individual to the department, thereby making it possible to raise our standards. The cabinets, supervisors' desks, and partitions of the main lubrication station are painted white. This feature also had its effect, resulting in neater and more efficient work. Each man is assigned a drawer at the main station where he can keep his personal tools. He is provided with a grease gun, oil cans, tallow pots, etc. This policy has reduced the replacement costs considerably. Records show that one man used the same oil can and grease gun for over 5 years by keeping them repaired at all times. When the same equipment was used by all three shifts no one was particularly interested in keeping it in first-class condition. Good tools and equipment have further raised lubrication standards.

Total number of machines and equipment is divided into equal sections and a lubrication service man is assigned to each one and is held responsible for all the routine work within his area. All routine work is set up on a definite frequency and consists of hand oiling, filling spindle cups, oiling motors, general greasing, etc.

Men are changed from one area to another periodically in order to train them as first class lubrication men and for supervisory positions.

Frequent Checks—If a machine is not running it is not lubricated. However, if it is down for more than 8 hours the rule is that it is not to be started until it is checked over for lubrication. The supervisor of production groups is responsible if the lubrication department has not been notified. Over the weekend when some machines are not running, a crew fills spindle cups and reservoirs. The men start up the machine 2 hours before the first shift begins on Monday morning. This procedure is followed so the operator can produce high precision work at the beginning of the shift without waiting for his machine to "warm up." The routine frequency is changed when and if a change is made from a 5-day week to a 6 or 7-day work week or vice versa.

Scheduled work pertains to those categories of lubrication which are set up at frequencies of 3 months or longer and consist of jobs such as greasing electric motors, changing the oil in gear cases, spindle reservoirs, etc. Oil in hydraulic and lubrication systems is set up to be filtered every 3 months. However, the oil is not filtered arbitrarily. If it is in good condition the filtration date is set up for another 3 months and so on until the oil needs filtering. Oil is filtered over and over again until such time as it becomes necessary for it to be changed. The change period is determined to a degree upon the neutralization number, but mostly upon other determining factors. The filters used are the portable type which permit the oil to be filtered while the machine is in operation.

One of the major expense items connected with lubricating machinery is walking time or transportation. Scheduled lubrication was set up so that not more than four trips to a machine are necessary during a year. Previous to this time more than ten trips were made. In order to accomplish this reduction in walking time, more categories of lubrication are serviced per trip and the best oils and greases are selected to extend the periods to conform to the schedule wherever necessary. Scheduled work is further confined to certain sections or divisions of the plant each month so the work is not scattered over a great area.

Categories of Lubrication

1. Hand Oiled Parts
2. Spindle
3. Lub. or Central Reservoir
4. Hydraulic Reservoir
5. Ways or Ways Reservoir
6. Knee Reservoir
7. Headstock or Work Head
8. Tractor Wheel
9. Air Line Lubricator
10. Bijur Pump
11. Tail Stock or Chuck
12. Gear Box
13. Turret-Apron or Head
14. Worm Gear and Head
15. Transmission
16. Motor Gear Head
17. Motor Bearings (Oil)
18. Chain or Chain Drive
19. Motor Bearings (Grease)
20. General Grease
21. All Pump Bearings
22. Fan Bearings
23. Gear Drive
24. Open Gears
25. Couplings
26. Fly Wheel Bearings
27. Solenoid Reservoir
28. Trueing Device
29. Cables
30. Screw
31. Speed Range Unit
32. Automatic Lubricator
33. Filter
34. Clutch

Transportation Costs Cut—To cut transportation costs still further, sub oil stations are situated throughout the plant so that walking time to and from the station and the machines is cut to a minimum. Sixty-five gallon lubsters are used at these stations for small volume needs. For large volume, drums are set up on four-wheeled racks which enable them to be pushed from one machine to another. Oil in the lubsters and drums is checked daily by the supervisor and the necessary supply ordered.

Men doing routine work are furnished with four-wheeled carts which hold four 5 gallon cans. The carts have a compartment on the back large enough to accommodate a hand grease gun, buckets, oil cans and one grease gun filler bucket. These carts help to reduce still further transportation cost. Several years ago the regular engine oil used for hand oiling was replaced by a higher quality oil that costs more, but which made it possible to reduce the frequency of hand oiling by 66 per cent. The cost of the oil was reduced since only one-third as much was used and the machine life was increased because a better lubricant was applied. All these improvements in transportation resulted in reducing the working crew by approximately 55 per cent.

In order that the cost of lubrication service can be charged correctly to the various groups, a time study was taken of all operations. Servicing time for each category of lubrication was recorded together with walking time, delayed action, personal time, etc., taking into consideration several hundred machines and equipment. Number of grease fittings on each machine type were counted, etc. There are well over 700 various types of machines, so the task was not easy. This information was typed up in a report which lists the machines in each group with time allowances for each type of lubrication that is found on a machine. It also summarizes the information so that we know the lubrication labor cost per machine, group division or the complete plant.

Cost of lubricants used by any individual machine can be ascertained by recording the amount of all grease or oil added at intervals, plus the original fill on a record form hung on the machine. When a new machine is put into operation, or production increases by starting up an idle existing machine, the service time is added, and vice versa. The time study also shows how many lubrication service men are needed, and it helps to divide the sections equally since the production is such that a man may have fifty to seventy different types of machines and/or equipment in his section.

Identification Systems—Many systems have been used in the past to identify the oil with the part of the machines so that the application of the correct lubricant would be assured. A simple system was finally adopted that calls for applying a small red disk, with a silver letter imprinted on its face symbolizing a certain oil or grease, on the inside of the filler caps, spindle cup, snap cap, etc. Inside of cap was chosen for protection against the painting, soiling, or removal of the codes.

The lubrication service man reports all oil leaks to the supervisor of the group whose responsibility it is to request a maintenance work order so that the leak is repaired by the proper maintenance group. If a machine starts using more than the normal amount of oil, the supervisor is advised to call the machine repair department to remedy this condition. Likewise, if the lubrication or hydraulic oil is being contaminated by coolant or cutting oil, a request is made to supply the necessary guards or repair the leak. Many gallons of oil have been saved by this procedure. Schedules are also better maintained since it takes a great many unnecessary trips by the lubrication service men to keep a leaking reservoir filled.

The standardization and simplification program continually being carried on has further helped to increase efficiency. The program calls for simplification of methods, operations, filing systems, records, etc. Standardization of oils, greases, materials, grease fittings, motor high level cups, and numerous other items make the job easier and more efficient.

Servicing Time Reduced—Over a year ago the lubrication department serviced 129 machines with straight cutting oils in a test case. It was found that the servicing time was cut by 75 per cent under the time it took the operators of the machines to do the job. Needless to say, the go-ahead signal was given on the balance of the machines and on the rest of the cutting and coolant oils. The checking and ordering of these oils was taken over first. This acquainted us with the type of oils and quantities so that charges would be prorated to the various groups correctly. In order to satisfy everyone a list of machines, together with their numbers, in each foreman's group, was prepared. These were given to the foreman with a request that he insert the name of the cutting oil being used, and in the case of a coolant to include the mixture. Meanwhile, all the coolant tanks in the plant were measured so that the exact gallon capacity was recorded. Pump displacement was also taken into consideration.

The returned lists started coming back and showed that twice the number of men would be needed to prepare all the various mixturs requested. After a consultation with the chemical laboratory, which controls the selection of new cutting oils and coolants, and general foremen of the productive groups, it was decided to extend the control of the mixtures and oils to the lubrication department. This situation is mentioned only because it is typical when operators service their own machines. The servicing of one straight cutting oil was taken at a time to avoid confusion. A tag was attached to each machine bearing the machine name, number, bay and name of the oil used. When this was completed, the coolants, one oil at a time, and only part of a division were added. Here again tags were hung on the machines. Mixtures, number of gallons of oil that have to be used in the event the tank has been cleaned by tank cleaners and refilled with water, were included on the information tag.

In the event a tank is low and requires a mixture of water and oil, the lubrication service man adds this mixture. It should be stated that the sections were made smaller. A lubrication man is responsible for servicing coolants and cutting oils along with lubricating oils and greases. All existing drops for water, paraffin oil, etc., were put into use, and wherever necessary additional drops were installed, suitable hoses attached to these drops so that machines in the area could be serviced direct from the line to the machine. Special reels were purchased that remain attached to the faucet while unreeling or reeling in.

Fifty-five-gallon drums were set up on four-wheel dollies in which soluble oil and water are premixed in exact proportions desired. These drums are pushed from one machine to another when it is necessary to replenish the supply. Flow of water was timed at several outlets and found to vary in different sections of the plant. Knowing the gallon flow, it is possible to fill large tanks with water direct from the hose by figuring gallons on a time basis.

The proper amount of oil is then added, depending on the number of gallons of water. Calibrated measuring sticks were made for large reservoirs so that they could be measured to determine how many gallons of water were added. Knowing this, the correct amount of soluble oil is added. Rate of water evaporation was also figured so that at specified intervals water was added to make up the deficit. Now that tanks are kept at the proper levels, pump life has increased and the draining of tanks is set at lesser frequencies than was formerly necessary.

Laboratory Supervision—No change in cutting oil or coolants can be made unless an approved cutting or coolant change form is first signed by the laboratory, lubrication department, and finally by the department head of the production group. There have been very few changes requested as a result of instituting this form. Also, if a test is to be run on a new oil, the three persons mentioned above sign the test approval form. The form provides spaces for a report of performance which is recorded daily by the lubrication department and submitted to the laboratory, and which makes the final decisions.

When the cutting oil program was completed, the ordering and servicing of general purpose oil was turned over to the lubrication department. Now the operators of machines who are paid a higher rate than the lubrication service men spend 100 per cent of their time on production. When operators lubricated the machines themselves, cost of the job was higher and much production time was lost.

With reference to the frequency of lubrication schedules, recommendations, etc., all this information is recorded in a visible file which contains a card for every machine and/or equipment in the plant. This is necessary since some machines are constantly changing locations, and new ones are coming in. These cards give complete information about lubricating oils, cutting, coolant and general process oils in any machine. The cards bear the following: Name of machine, number, location, and division on the bottom line so it is plainly visible in the file. In the upper left corner are the numbers 1 to 35, each number represents a category of lubrication. The various lubricants are lettered, making it an easy matter to print the code of the oil opposite the category found on the machine.

A simple example of this system would be 1-H, 2-C, 19-S. No. 1 represents hand oiling with H-oil, 2 represents spindle with C-oil, and 19 represents motor grease with S-grease. Codes eliminated 75 per cent of the typing that was formerly found to be necessary.

To the right of this box is a place to list materials used for added accessories on a new machine. The next box to the right is used to record the gallon capacity of each reservoir found on a machine. Below and in the first wide column the number of the category is listed which is scheduled at intervals of 3 months or longer. In the next column the frequency is listed by the numbers of months. To the right and in the column next to the double line, date machine was serviced is recorded. Next column is used to set up the next scheduled date. At the bottom, J, F, etc., represent the months of the year. The file is checked at the end of the month and all the scheduled work for the next month is recorded on a work sheet and is given to the supervisor for further handling. When the work is completed and checked off, the sheets are returned to the office and the next service date is set up.

Cutting and general purpose oils are more or less self explanatory. Numbers are used for straight cutting oils from 1 to 19 and numbers in increments of 10 from 20 up to 90 for coolants. The tags are now in the process of being eliminated and the soluble oil codes will be imprinted on the tanks, in the following manner: If the oil is No. 20, the zero will be dropped, if the mixture is one to 40, the one and the zero are dropped and if 3 gallons of oil are to be added for the make up of a full tank the result will be 243. The general purpose oils are identified on equipment C-1, to C-5, C for cleaning; R-1 to R-5, R for rust preventives; T-1 to T-5, for testing fluids, etc.

THE ROLE OF CUTTING FLUID AS A LUBRICANT[1] *

ABSTRACT

An analytical investigation shows that in two-dimensional metal cutting a continuous lubricant film does NOT exist in the sense usually considered in lubrication problems. Oil, carbon dioxide, chlorine, and water were considered as lubricating media.

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Dr. S. Raynor received his BS and PH.D from the Federal Institute of Technology, Zurich, Switzerland. He was associated with the University of Barcelona and came to the U. S. in 1938. He worked with the University of Chicago (Manhattan Project) as a Physicist and in 1945 joined the Armour Research Foundation. His present position is Assistant Chairman Applied Mechanics Research.

In some metal cutting experiments the cutting fluid appears to reach the tool-chip interface. Examination of the workpiece and the chip under ultraviolet light indicates the presence of oil in the form of thin lines oriented in the direction of chip flow.

The question of the existence of a continuous fluid film in the tool-chip interface is controversial; some investigators believe that it does not exist, due to the high temperature and pressure. The subject of this paper is the theoretical substantiation of the negative point of view.

In order to proceed with the analysis, it is necessary to evaluate:

1. The pressure between the tool and chip;
2. The temperature at the tool point;
3. The viscosity of the cutting fluid at this pressure and temperature;
4. The thickness of the fluid film for a given pressure, friction drag and viscosity; and
5. The possible existence of a film whose thickness is thus determined.

[1] The results presented here were obtained during an investigation sponsored by the Shell Oil Company at Armour Research Foundation, Chicago, Illinois.

* Paper presented at 4th Annual Convention of A.S.L.E., New York City, April 13, 1949.

The Pressure Between Tool and Chip

The geometry of the process of cutting due to Piispanen (1)[2], Ernst, and Merch nt (2, 3) is represented in Fig. 1. The relations between forces, stresses, and geometry given by these authors are:

$$H = R_0 \cos(\beta - \alpha) \qquad P = R_0 \cos\beta$$

$$P = H \frac{\cos\beta}{\cos(\beta - \alpha)}$$

The unit normal pressure on the tool tip at the chip interface is $p_N = \frac{P}{3bt}$ if it is assumed that the contact between tool and chip is 3t (three times the depth of cut, t) and the width of cut is b.

Then

$$\sigma_N = p_N = \frac{H}{3bt} \frac{\cos\beta}{\cos(\beta - \alpha)}.$$

Typical values are:

$\beta = 45°$ $\qquad \cos\beta = 0.707$

$\alpha = 10°$ $\qquad \cos(\beta - \alpha) = 0.819$

[2] Numbers in parentheses refer to similarly numbered references in the Bibliography at the end of this paper.

and $\frac{H}{bt}$ is reported to vary from 250,000 psi to 600,000 psi for cutting steel. These values show that the average normal pressures at the tool-chip interface are of the order of magnitude of

$$p_N = 96{,}000 \text{ to } 230{,}000 \text{ psi.}$$

A value of 50,000 psi was chosen for the further calculations representing a less severe condition of metal cutting. The viscosities of the various media were estimated for this pressure.

The Temperature at the Tool Point

The rise in temperature of the workpiece and chip is due to (i) friction at the tool-chip interface, (ii) deformation in shear of the material being removed, and (iii) plastic deformation of the workpiece. The plastic shear deformation contributes the bulk of the temperature rise. Analysis and experimental evidence (4, 5, 6) indicate a temperature of approximately 1,000 F. A temperature of 900 F was used in the subsequent calculations.

The Viscosity of the Cutting Fluid

Several "cutting fluids" were considered, such as California oil, water, chlorine, and carbon dioxide.

Experimental data are given for the viscosity of a blended California oil (7, 8, 9) at pressures up to 46,000 psi and at temperatures of 100 F, 130 F, and 210 F (Fig. 3) In order to extrapolate the viscosity to the desired pressure and temperature, an empirical equation was established for these experimental data. This equation is

$$\eta = \eta_i e^{(\lambda+\Theta p)\left(\frac{1}{T}-\frac{1}{T_i}\right)}$$

where

$\eta_i = 0.008$ poise is the viscosity in the inversion point,
$T_i = 890$ degrees R is the temperature in the inversion point,
$\lambda = 7{,}380$ degrees R, and
$\Theta = 0.311$ degrees R per psi } empirical constants.

According to this equation, the viscosity increases with pressure when the temperature is above 430 F, and it decreases with pressure when the temperature is below 430 F. However, the extrapolation from the test data into this region is too unreliable, and it is assumed that the viscosity at very high pressures and temperatures does not drop below the value obtained for the inversion point. Thus the viscosity of lubricating oil at the given cutting pressure and temperature is approximately

$$\eta \approx 8 \times 10^{-3} \text{ poise.}$$

The values of viscosity for water, chlorine, and carbon dioxide were obtained from the theories of Sutherland and Enskog (10), using known empirical constants (11, 12).

If $\eta(p_o,T_o)$ = viscosity at pressure 1 At and temperature O C,
$\eta(p_o,T)$ = viscosity at pressure 1 At and temperature T abs, and
$\eta(p,T)$ = viscosity at pressure p and temperature T abs,

then the viscosity at an arbitrary pressure and temperature can be written

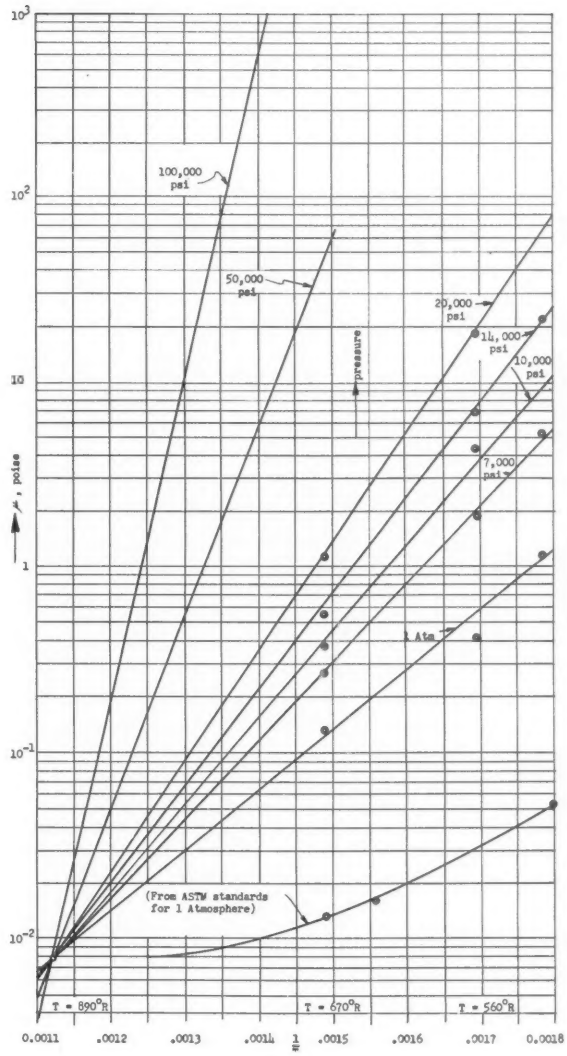


Fig. 3
Viscosity of California Oil
(According to Dow, Fenske, Morgan, *Ind. Eng. Chem.*, V 29, p. 1078.)

$$\eta(p,T) = \eta(p_o,T_o)\frac{\eta(p_oT)}{\eta(p_o,T_o)} \times \frac{\eta(p,T)}{\eta(p_o,T)}$$

where $\eta(p_o,T_o)$ is given, according to (10) and (12),

$$\frac{\eta(p_o,T)}{\eta(p_o,T_o)} = \sqrt{\frac{T}{T_o}}\,\frac{1+\frac{S}{T_o}}{1+\frac{S}{T}}, \text{ according to (10),}$$

$$\frac{\eta(p,T)}{\eta(p_o,T)} = \frac{0.7614}{1-\frac{B}{v}} - 0.9614\frac{B}{v} + 0.2386, \text{ according to (10),}$$

and v = specific volume of gas at the selected temperature and pressure,
S = Sutherland constant in degrees R.

The constants in the above equations are, from (10, 11, 12):

		Carbon Dioxide	Chlorine	Water
B	cm^3/g	0.0432	0.0354	0.0755
S	deg R	432	585	800
$\eta(p_o,T_o)$	poise	1.388×10^{-4}	1.218×10^{-4}	0.948×10^{-4} (extrapolated)

The value of v must be calculated from an equation of state valid for the region in question. If the van der Waals equation,

$$p+\frac{a}{v^2}=\frac{RT}{v-B}$$

is used, the values of v and η at 1,000 F and 50,000 psi are:

		Carbon Dioxide	Chlorine	Water
a	cm^4/g	1.87×10^{6}	1.29×10^{6}	16.9×10^{6}
R	cm/deg C	1927	1200	4706
v	cm^3/g	0.0449	0.0364	0.0768
η	poise	6.81×10^{-3}	8.96×10^{-3}	1.95×10^{-3}

It should be noted that the values of viscosity of these gases and of oil are of the same order of magnitude:

$$\eta\approx10^{-2} \text{ poise.}$$

Thickness of a Viscous Fluid Film Supporting Pressure Under Conditions of Metal Cutting

The accepted geometry of chip formation is shown in Figs. (1) and (2). The configuration of Fig. (2a) was assumed to exclude the possibility of the existence of a hydrodynamic fluid film while the assumed motion of the segmental chip, Fig. (2b) admits such a possibility. A fluid film may or may not exist for the case of a continuous chip with built up edge. If it can be shown for the configuration of Fig. (2b) that the thickness of the fluid film is less than the sum of the irregularities of the sliding surfaces, a hydrodynamic fluid film does not exist in the metal cutting process, whatever the mechanism of chip formation might be. The problem of "squeeze" lubrication was not considered.

The flow of the fluid in the wedge-shaped region between h_1 and h_2 due to relative motion produces a pressure p, having a resultant P representing the load. A force F is necessary to maintain the relative velocity U. This force corresponds to the frictional drag.

The symbols of Fig. 2 and the following notations are used:

μ=absolute viscosity of the lubricant, lb-sec-in^{-2};
b=tool width, in;
$\frac{h_1}{h_2}=a$;
B_o=length of contact between tool and chip;
p=average pressure in the fluid, psi; and
τ=average shear stress in oil at the tool face, psi.

The values of the load P and the friction drag F can be calculated as follows (13):

$$P=\frac{6\mu UB_o^2b}{h_2^2(a-1)^2}\left[\log_e a-\frac{2(a-1)}{a+1}\right] \quad (1)$$

$$F=\frac{\mu UB_ob}{h_2(a-1)}\left[4\log_e a-\frac{6(a-1)}{a+1}\right] \quad (2)$$

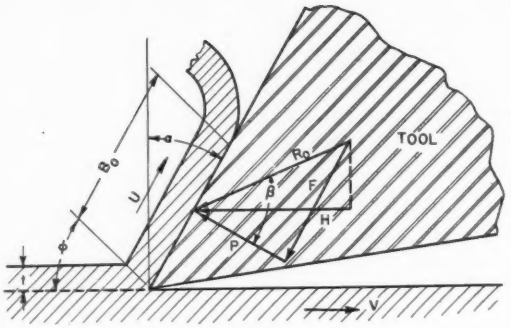
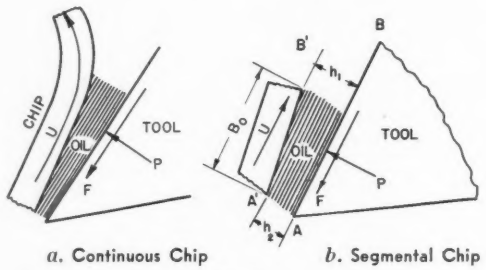


Fig. 1
Forces in a Cutting Process.



a. Continuous Chip *b.* Segmental Chip

Fig. 2
Enlarged View at the Tool Point Showing Assumed Geometry and Conditions for Existence of Lubricant Film in a Cutting Operation.

$$P=pB_ob \quad (3)$$

$$F=\tau B_ob \quad (4)$$

Dividing Equation (1) by (2) squared, and substituting Equations (3) and (4), one obtains

$$\frac{\mu Up}{6B_o\tau^2}=\frac{\log_e a-\frac{2(a-1)}{a+1}}{\left[4\log_e a-\frac{6(a-1)}{a+1}\right]^2}$$

The value of a can be computed from Equation (5) and the value of h_2 from Equation (1).

The following values will be considered:
Cutting speed, V=100 feet per minute;
Depth of cut, t=0.010-inch;
Shear angle, ϕ=20 degrees;
Rake angle, α=10 degrees;
Friction angle, β=45 degrees;
Viscosity of the cutting fluid, $\eta=10^{-2}$ poise;
Average pressure in the fluid, p=50,000 psi.

The velocity of the chip is related to the cutting speed by the following equation:

$$U=\frac{V\sin\phi}{\cos(\phi-\alpha)}=\frac{100\times12\times\sin20}{\cos10\times60}=7 \text{ in per sec.}$$

The length of contact, B_o, is approximately

$$B_o=3t=0.030\text{-in.}$$

The shear stress, τ, due to the friction angle of 45 degrees is equal to p. The viscosity, $\eta=10^{-2}$ poise, corresponds to $\mu=1.45\times10^{-7}$ lb-sec-in^{-2}. By introducing these values into Equation (5), the result is

$$\frac{\mu Up}{6B_o\tau^2} = \frac{\log_e a - \dfrac{2(a-1)}{a+1}}{\left[4\log_e a - \dfrac{6(a-1)}{a+1}\right]^2} = \frac{1.45\times10^{-7}\times7}{6\times0.030\times50{,}000} = 1.13\times10^{-10} \qquad (6)$$

This result shows that a is approximately equal to unity. Substituting $a=1+\epsilon$, where ϵ is a small quantity, the right side of Equation (5) can be simplified by replacing the function with its corresponding power series in ϵ and neglecting high powers of ϵ. Then Equation (5) can be replaced by

$$\frac{\mu Up}{6B_o\tau^2} \approx \frac{a-1}{12} \qquad (7)$$

or for the case considered

$$\frac{a-1}{12} = 1.13\times10^{-10}$$

Solving for a,

$$a = 1.00000000136$$

Substituting Equation (3) in Equation (1) and expanding the terms for $a=1+\epsilon$ in power series of ϵ gives the following expression:

$$h_2^2 \approx \frac{\mu UB_o(a-1)}{2p}$$

For the case considered,

$$h_2^2 = \frac{1.45\times10^{-7}\times7\times0.030\times1.13\times10^{-10}\times12}{2\times50{,}000}$$

$$= 4.12\times10^{-22}\ \text{in}^2$$

$$h_2 = 2.03\times10^{-11}\ \text{in.}$$

Possible Existence of Continuous Oil Film

Since the minimum thickness of an oil film encountered in the usual lubrication theory is of the order 10^{-3} inches (limited by the sum of the irregularities of both sliding surfaces), the above result shows that a continuous fluid film, in the sense usually considered in lubrication problems, does not exist. The fluid may be carried in pockets, and boundary lubrication prevails. The products of reaction between the metal being cut and cutting fluid components (like S and Cl) produce a film of solids of low shear strength.

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Discussion by Hans Ernst

Research Director, Cincinnati Milling Machine Co.

The authors have presented an interesting analysis showing that if the geometrical relationships in the region of the chip-tool interface were such as to permit the formation of a hydrodynamic fluid film, this film would possess an impossibly small thickness under the values of temperature and pressure which exist with a machining operation of moderate severity. While this is an interesting conclusion, the entire analysis appears to be based on an impossible premise.

On page 5 of the paper the statement is made that if we "consider the motion of the chip relative to the cutting tool, the geometry and flow conditions can be represented by Figure 2.*" This statement we strongly object to. If we assume that the upper body in this figure represents the chip moving in the direction U (which corresponds with Figure 1 both in this respect and in the cross hatching of the chip and tool sections) then Figure 2 shows a fluid film converging in the direction of chip motion. But no evidence has been presented either by the authors, or any other investigator, that a fluid-filled, converging region such as this exists between the adjacent face of chip and tool. Actually there is ample evidence to the contrary from high-speed motion pictures of chip formation and photomicrographs of partially formed chips.

We would also disagree with the concluding statement of both the abstract and paper that "partial metallic contact between tool and chip cannot be avoided." Even though the geometry at the interface is not such as to permit the formation of a continuous fluid film, it is still possible for the fluid trapped in minute pockets in this region to provide boundary lubrication.

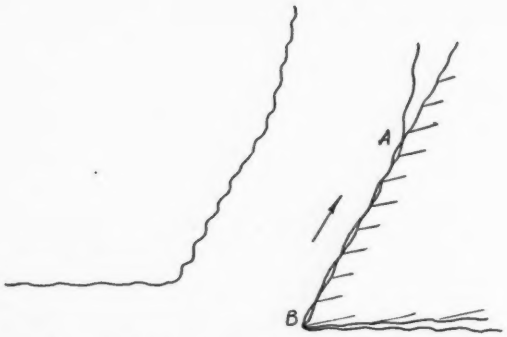
* Fig. 2 of the original draft of this paper has been changed by the authors to become Fig. 2a, as discussed in the author's closure. (Ed.)

Discussion by Milton C. Shaw

Metal Cutting Research Lab., Massachusetts Institute of Technology

In this paper the authors attempt to prove that a hydrodynamic film cannot exist at the point of a cutting tool. While it is obvious that this conclusion is valid, the writer does not believe the argument cited to be the real reason. The entire development is based upon the existence of a fluid wedge as shown in Fig. 2.* The writer believes that if any wedge exists it will be inclined opposite to that shown in Fig. 2. It is well known that in such a case ($h_1 < h_2$), negative rather than positive hydrodynamic pressure will tend to develop.

The figure accompanying this discussion shows the probable picture at the chip-tool interface. There is inclination between the surfaces in the vicinity of A where the chip curls away from the tool. Here, however, the angle between the surfaces is such that positive hydrodynamic pressure cannot be obtained *regardless of the viscosity of the cutting fluid.* If there is any inclination between the chip and the tool in the region extend-



ing from A to B it is not evident how it could be in the direction assumed by the authors (with $h_1 > h_2$) unless a crack is propagated in front of the tool. Such a crack is generally not considered to exist.[1] In any case, a source of fluid must be available at the tool point to supply continuously the fluid that is carried upward by the chip. It is not seen where this fluid could come from. It would therefore appear that the existence of a hydrodynamic film may be clearly ruled out on the basis of geometric considerations alone.

Having decided that a hydrodynamic load supporting film cannot exist, the authors conclude that some metallic contact cannot be avoided. The writer does not believe this need be the case when an effective cutting fluid is employed. Considerable experimental evidence[2] supports the view that cutting fluids reduce friction at the chip-tool interface by reacting chemically with the chip surface to produce a low shear strength *solid* lubricant. This material forms under the conditions of high temperature and pressure present on the face of the chip in the region AB. The lubricant is drawn into this region from point A by large capillary forces. If an effective cutting fluid is employed which results in low friction, it is likely that metallic contact does not exist, but rather that the high points at the chip-tool interface are separated by a low shear strength solid film.

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Author's Closure to Discussions

The authors are grateful for the comments of the discussers. Mr. Ernst's objections resulted from interpretation of Fig. 2 in the preliminary draft of the paper. Since this figure was ambiguous, it was replaced by Figs. (2a) and (2b), where in Fig. (2a) it is assumed that a hydrodynamic fluid film cannot exist if the chip is continuous. On the other hand Fig. (2b) applies to a segmental chip for which such a fluid film might exist. The analysis which applies to Fig. (2b), however, remains unchanged. Mr. Ernst's comments with regard to boundary lubrication are accepted as representing the prevailing view of the regime pertaining to the conditions under which cutting takes place.

Mr. Shaw's objections are much the same as those of Mr. Ernst with whom the authors are in agreement. Again reference to Figs. (2a) and (2b) of the paper should resolve any further arguments of this nature. Mr. Shaw's explanation of the interaction between the tool and chip surfaces during the cutting process is supported experimentally so that a condition of solid lubrication prevails. Mr. Shaw claims that the lubricant is drawn into the region of the tool-chip interface by large capillary forces; however, experiments conducted at the Armour Research Foundation by W. E. Lauterbach and E. A. Ratzel show that the cutting fluid under some conditions may flow from the clearance crevice (between the tool and workpiece) into the region of the tool-chip interface. The conditions of Fig. (2b) therefore are consistent with these experimental observations.

convention hi-lites

Notes From Our Program Chairman

Don't miss the "Plant Lubrication Practice" session to be held in the Wayne Room on Monday afternoon. This will be an open and informal discussion. Anyone attending can throw in his two cents' worth for what it is worth. Lou Danse will be presiding, and he promises that the afternoon will be "both lively and bloody." Here is a chance to discuss the problems that have been stumping you as well as an opportunity of learning how others have solved their tough ones. No one can afford to pass up this part of the Convention.

* * *

We are certainly fortunate to have Mr. C. F. Kettering as our banquet speaker. It isn't often that we can hear a man of his technical ability and international prominence. Let's all turn out to the banquet and show "Boss Ket" that we're glad to have him with us.

* * *

The Symposium on Oil Reclaiming to be held in the Wayne Room on Tuesday afternoon should turn out to be one of the outstanding technical sessions in the history of our Society. The symposium is a timely one, as the need for clarification of this topic has been felt industry-wide for many years, due to its importance both from the standpoint of economics of lubrication and product quality.

Under the able Chairmanship of Dr. D. D. Fuller of Columbia University, Mr. D. M. Cleaveland of Bendix will lead off the discussion, pointing to the significance of oil reclaiming from the viewpoint of conservation, safety and economics. He will also report on his Company's experience on oil reclaiming. His talk will be followed by a series of short discussions by prominent representatives of oil consumers, oil suppliers, and manufacturers of reclaiming and purification equipment. During the three-hour symposium, ample time will be provided for a lively discussion from the floor.

* * *

This year we are having a Breakfast for Authors and Chairmen on Tuesday and Wednesday mornings. Those participating in the Convention Program will be the guests of the Society on the day they "strut their stuff." We have great hopes that this will not only permit everyone to get acquainted but that we can get things organized so that the day's program can proceed smoothly and without a hitch.

* * *

Because of Detroit's position as the mass production center of the automotive field, and realizing the desire of many members and guests to avail themselves of the opportunity to visit an outstanding plant, time was allocated on the program for a plant tour. The National Program and Detroit Convention Committees felt it would be a striking feature of the three-day session. Special busses will be available at the Hotel Statler for the accommodation of those planning to make the tour.

Located adjacent to the Ford Motor Company-Rouge Plant is the well known historical Greenfield Village and a visit to the Village is planned as a special event for the ladies.

* * *

The first President of A.S.L.E. will act as toastmaster at our 5th Anniversary Banquet, April 11th, Detroit. Let's all be there and support Mr. Charles E. Pritchard on this occasion.

E. D. HARKINS, SR.
The Farval Corp.

detroit invites you

J. W. HOPKINSON
(Pres.) Penn-Petroleum Corp.

Mr. E. D. Harkins, Sr., Chairman of the Detroit Section, A.S.L.E., and Mr. James W. Hopkinson, Chairman of the Detroit Convention Committee, members of the various Committees, and the entire Detroit Section membership, through these columns, send you the following message:

"The Detroit Section of The American Society of Lubrication Engineers is sincerely grateful, but a bit humble, for being selected as the Host Section for the Fifth Annual Convention and Third Annual Exhibit. Our Committees have worked diligently and long to make your visit to Detroit a pleasant and memorable one. Certainly we have many places of interest for the membership to visit, plants skilled in high production methods, engineering 'know-how' and mass operations that are unique to this city. In addition to that, our Ladies' Committee has been engaged in arranging activities which we members of the Detroit Section feel will make the ladies attendance at the Convention one which will be long remembered. This is a grand opportunity to enjoy a short Easter vacation. We wish to extend greetings to all and a cordial invitation to members and their wives to be with us the evening of Sunday, April 9th, through Wednesday, April 12th."

INTRODUCING THE MEN IN DETROIT WHO ARE PLAYING SUCH A LARGE PART IN ASSURING THE SUCCESS OF THE FORTHCOMING CONVENTION:

Detroit Section

Officers and Committees — 1950

Edwin D. Harkins ..... The Farval Corp.
Chairman
Edward S. Kelly ..... The Budd Company
Vice Chairman
Russell W. Kenyon ..... L. R. Kerns Company
Secretary
John W. Swain ..... Mergraf Oil Prod. Company
Treasurer
Paul D. Wright ..... City of Detroit
Committee Man (At Large)

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Chairman
L. A. Danse ..... General Motors Corp.
Counselor
W. H. Cameron ..... Chrysler Corporation
C. L. Howard ..... Pontiac Motor Div., G.M.C.
J. T. Elliot ..... E. F. Houghton Company
J. W. Swain ..... Mergraf Company

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E. S. Kelly ..... The Budd Company
Chairman
L. E. Ashcraft ..... The Brooks Oil Company
J. G. Shannon ..... The Texas Company
C. F. Cowley ..... Fiske Bros. Refining Company
J. Q. Adams ..... E. F. Houghton Company
Arthur Melford ..... Lincoln Mercury Div., Ford Mot. Co.
H. D. Brown ..... Penn Petroleum Corp.

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J. W. Hopkinson ..... Penn Petroleum Corp.
Chairman
J. W. Fauver ..... J. N. Fauver Company
P. D. Wright ..... City of Detroit
R. O. Smith ..... Alemite Company
J. J. Meehan ..... The Texas Company
W. A. Marshall ..... Alemite Company

ATTENDANCE AND GREETING COMMITTEE

H. G. Stringer ..... Shell Oil Company
Chairman
B. B. Phelps ..... Pure Oil Company
G. D. Salisbury ..... National Colloids Company
M. W. Turnley ..... Wayne Chemical Company
Wm. Mees ..... Lincoln Engineering Company
C. H. Guider ..... Dept. of St. Railway, City of Detroit

ENTERTAINMENT COMMITTEE

M. B. Lawton ..... Lincoln Engineering Company
Chairman
J. A. Brady ..... Penola, Inc.
J. P. Dryer ..... The Texas Company
D. Benner ..... Lincoln Engineering Company
R. M. Morens ..... Lincoln Engineering Company

Program

Fifth Annual Convention and Third Annual Exhibit

THE AMERICAN SOCIETY OF LUBRICATION ENGINEERS

Mon., Tues., and Wed., April 10-11-12, 1950

HOTEL STATLER — DETROIT, MICHIGAN

MONDAY, APRIL 10, 1950

9:00 A. M.—REGISTRATION—Ballroom Floor
Hotel Statler
Official Opening of Exhibits

11:00 A. M.—GENERAL SOCIETY BUSINESS MEETING

Chairman: E. D. Harkins, Sr.

President's Message—C. L. Pope

Secretary's Report to Members—W. F. Leonard

12:30 P. M.—WELCOME LUNCHEON

MICHIGAN ROOM

Speaker: (To be announced)

Chairman: James W. Hopkinson

Welcome to Detroit by the Honorable Alfred E. Cobo, Mayor of the City of Detroit

2:15 P. M.—OPENING TECHNICAL SESSION

WAYNE ROOM

SESSION 1

PLANT LUBRICATION PRACTICE

An open and informal discussion.

L. A. Danse, General Motors Corp., presiding.

Exhibits Open to 10:00 P. M.

TUESDAY, APRIL 11, 1950

7:30 A. M.—Breakfast for authors and chairmen.
Parlor F

9:00 A. M. to 12:00 Noon

WAYNE ROOM

Chairman: J. T. Elliott

SESSION 2-A

"Maintenance of Hydraulic Systems" — M. A. Hayden, Vickers, Inc.

"The Separation of Lubricating, Hydraulic Actuating, and Cooling Systems in Machine Tool Design"—D. P. Morrell, Ford Motor Co., and O. E. Hoover, Chrysler Corp.

"Multi-Functional Lubricants" — E. M. Kipp, Aluminum Company of America.

9:00 A. M. to 12:00 Noon

MICHIGAN ROOM

Chairman: P. W. Uhl

SESSION 2-B

"Friction and Wear of Bearing Materials Containing Molybdenum Disulfide" — R. L. Johnson, M. A. Swikert, and E. E. Bisson, National Advisory Committee for Aeronautics.

"The Lubrication of Sliding Electrical Contacts" —W. E. Campbell, Bell Telephone Laboratories.

"Oil Flow in Journal Bearings"—H. H. Gillespie and W. V. Smith, Bearings Div., Bureau of Ships, U. S. Navy Department.

Exhibits Open to 6:00 P. M.

TUESDAY, APRIL 11, 1950 (Continued)

2:15 P. M. to 5:00 P. M.

WAYNE ROOM

Chairman: D. D. Fuller

SESSION 3-A

"Reclaiming Industrial Petroleum Products" — D. M. Cleaveland, Bendix Products Div., Bendix Aviation Corp.

SYMPOSIUM ON OIL RECLAIMING

Wayne Lasky, Gulf, Mobile & Ohio R. R. Co.
J. J. Penn, Crane Co.
J. T. Hendren, Pan American World Airways System
Wayne Goodale, Standard Oil Co. of California
A. R. Black, Shell Oil Co.
W. G. Sylvester or G. D. Ebrey, Walter Kidde & Co.
E. M. May, Bowser, Inc.
W. S. James, Fram Corp.
J. P. Kovacs, Purolator Products, Inc.
Kenneth Reed, De Laval Separator Co.

2:15 P. M. to 5:00 P. M.

MICHIGAN ROOM

Chairman: M. B. Lawton

SESSION 3-B

"Load, Speed and Operating Temperature of Roll Neck Bearings"—J. H. Hitchcock, Morgan Construction Co.

"Studies of the Load Carrying Capacity of Sleeve Bearings"—C. M. Allen and K. A. Davis, Battelle Memorial Institute.

"Preliminary NACA Research on Roller Bearings at High Speeds"—E. F. Macks and Z. N. Nemeth, National Advisory Committee for Aeronautics.

7:30 P. M.—ANNUAL BANQUET

WAYNE ROOM

Toastmaster: Charles E. Pritchard

Speaker: Charles F. Kettering, former Vice President and Director of General Motors Corp.

Introduction of New Officers.

Presentation of Awards:
Alfred E. Hunt Memorial Medal
Walter D. Hodson Award

(Dress Informal)

Exhibits Open to 6:00 P. M.

WEDNESDAY, APRIL 12, 1950

7:30 A. M.—Breakfast for authors and chairmen.

Parlor F.

9:00 A. M. to 11:00 A. M.

WAYNE ROOM

Chairman: E. S. Kelly

SESSION 4-A

"Friction Oxidation in Aircraft and Aircraft Accessories"—Adolph Rahm, Wright-Patterson Air Force Base, Air Materiel Command, U. S. Air Force.

"The Application of Wear Resistant Phosphate Coatings to Ferrous Surfaces" — M. B. Roosa, Parker Rust Proof Co.

9:00 A. M. to 12:00 Noon

MICHIGAN ROOM

Chairman: H. G. Stringer

SESSION 4-B

"Lubricating Oils in Refrigeration"—E. S. Ross, Sun Oil Co.

"Mechanical Seals and Their Relationship to Good Lubrication Practice" — C. E. Schmitz, Crane Packing Co.

"Oil Mist Lubrication"—E. R. Harris, Alemite Div., Stewart-Warner Corp.

1:30 P. M.—PLANT TOUR
Ford Motor Company, Rouge Plant, Dearborn, Michigan.

4:30 P. M.—BUSINESS MEETING OF OFFICERS AND DIRECTORS, A.S.L.E.

Exhibits Open to 6:00 P. M.

This program has been carefully planned to be of real value to men who design, operate and maintain today's highly complex industrial machinery. The American Society of Lubrication Engineers, its officers, and the Detroit Convention Committee extend a cordial welcome to all those interested, to attend the technical and social functions listed above.

Registration fees: Members, $1.00; Non-Members, $3.00, of which $2.00 may be credited towards membership dues in the Society if application is made within thirty days, after the Convention.

Additional notes and comments relative to the Convention will be found on other pages of this issue.

Third Annual Exhibit Devoted Exclusively to Lubrication

3 IMPORTANT DAYS--

APRIL 10-11-12, 1950

HOTEL STATLER—DETROIT, MICH.

The leading manufacturers of lubrication products have combined to bring out the actual value of lubrication as a functional part of plant production

SHOWING: LUBRICANTS, PETROLEUM AND SYNTHETIC—CHEMICALS—ADDITIVES—CUTTING OILS AND COMPOUNDS—SPECIAL OILS AND GREASES—LUBRICATION DEVICES FOR APPLICATION—FILTRATION—TESTING—HANDLING—THE LATEST DEVELOPMENTS AND METHODS COVERING THE ENTIRE FIELD OF LUBRICATION.

PROPER LUBRICATION—*The Insurance Policy of Production*

Among the Companies Exhibiting Are

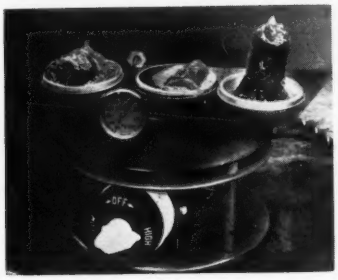
ALEMITE DIVISION OF STEWART-WARNER CORP.	Chicago, Ill.
ARO EQUIPMENT CORP., THE	Bryan, Ohio
BEARING & GEAR LUBRICANT CO.	Milford, Mich.
BOWSER, INC.	New York, N. Y.
CARBIDE AND CARBON CHEMICALS DIV. UNION CARBIDE AND CARBON CORP.	New York, N. Y.
COMMERCIAL FILTERS CORP.	Boston, Mass.
CUNO ENGINEERING CORP.	Meriden, Conn.
DE LAVAL SEPARATOR CO., THE	New York, N. Y.
DOLGE CO., THE C. B.	Westport, Conn.
EAGLE MANUFACTURING CO.	Wellsburg, W. Va.
FARVAL CORP., THE	Cleveland, Ohio
FAUVER CO., J. N.	Detroit, Mich.
GERIN CORP.	Red Bank, N. J.
GULF OIL CORP.	Pittsburgh, Pa.
HOUGHTON & CO., E. F.	Philadelphia, Pa.
LINCOLN ENGINEERING CO.	St. Louis, Mo.
McCORD CORP.	Detroit, Mich.
MANZEL, INC.	Buffalo, N. Y.
NUGENT & CO., INC., WM. W.	Chicago, Ill.
PENOLA, INC.	Detroit, Mich.
PUROLATOR PRODUCTS, INC.	Newark, N. J.
SHELL OIL CO.	New York, N. Y.
SINCLAIR REFINING CO.	New York, N. Y.
SOCONY-VACUUM OIL CO., INC.	New York, N. Y.
STUART OIL CO., D. A.	Chicago, Ill.
SUN OIL CO.	Philadelphia, Pa.
TEXAS CO., THE	New York, N. Y.
TIDE WATER ASSOCIATED OIL CO., INC.	New York, N. Y.
TRABON ENGINEERING CORP.	Cleveland, Ohio
WARREN REFINING & CHEMICAL CO., THE	Cleveland, Ohio

• ***EXHIBITION HALL—BALLROOM FLOOR*** •

APRIL 10.....9 A. M. to 10 P. M.
APRIL 11-12.....9 A. M. to 6 P. M.

MONDAY, APRIL 10
SPECIAL INDUSTRIAL NIGHT—6 P. M. to 10 P. M.

NEW PRODUCTS and EQUIPMENT



Plastilube: Warren Refining & Chemical Co., 750 Prospect Ave., Cleveland 15, Ohio—Announcement is made of a recent development of a new all-purpose lubricant. The manufacturer claims it has no melting point, possesses greater adhesive qualities, excellent pumpability at low temperatures, and does not break down during working. The accompanying illustration, taken in Warren's laboratories, shows equal quantities of barium grease (left), lithium grease (center), and Plastilube on a hot plate with a temperature reading of 345 F, demonstrating that this new lubricant is unaffected by heat. According to the manufacturer, Plastilube is adaptable for virtually every automotive and industrial use. Write for further information.

Trabon Expands: Trabon Engineering Corp., 1814 E. 40th St., Cleveland, Ohio—This company, which is recognized as one of America's leading manufacturers of automatic grease and oil lubricating systems, has licensed a British firm, the Exactor Control Co., Ltd., 108 Park St., London, to produce the same type of equipment as the controlling company. The new division will be known as Exactor-Trabon. The territory served by the new company includes Great Britain and Continental Europe.

Collective Volume I: American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.—This bulletin is a compilation of data on new chemicals which have become available from the company's research laboratories during the last year and on which separate bulletins have been issued. Copies available by writing to the New Products Development Department of the above company.

Magna-Sight Flow Gauge: Fischer & Porter Co., Hatboro, Pa. — Announcement is made of a redesigned flow gauge. The unit consists of a short body, with flanged or screwed pipe connections, accommodating a fixed orifice in the lower end. A tapered metering plug rises and falls according to fluid flow rate. It is available in brass, bronze, iron, and steel, in sizes ¾" to 4" with maximum capacities of 3.5 to 250 gallons per minute. Write for catalog 96.

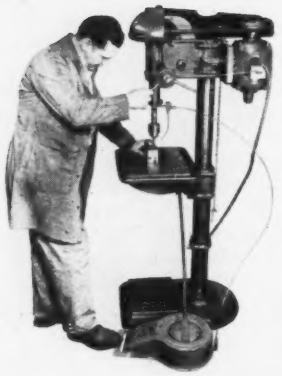
Under-Feed Oiler: Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee 12, Wisc.—This oiler is intended for mounting at the base of the bearing. Felt wick delivery of lubricant by spring action. Feed is by capillary attraction. Folder No. 32 available upon request.

Spray Lubrication: Manzel, Inc., 315 Babcock St., Buffalo 10, N. Y.—A recent development of this company is the mechanical lubricator for use on all types of conveyors. Timing mechanism is provided to actuate the air valve, releasing an accurately aimed spray of oil directly to the moving parts. It is claimed that oil drippage has been completely eliminated.

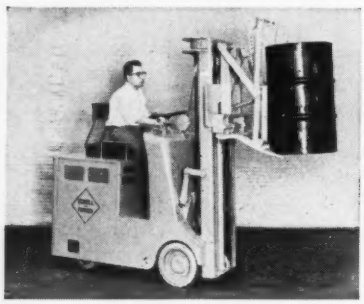
Wooden Bearings Manual: Paramount Oilless Bearing Co., Worcester, Mass.—This engineering manual considers application of wood bearings in certain fields where no other type can serve the purpose so efficiently. It treats of the basic engineering principles involved in calculating loads on bearings, analyzing friction, determining wood and lubricant characteristics, effects of circular motion and bearing temperatures. From these factors are derived some typical applications. The manual is loaned to accredited engineers and machine designers on request.

Molybdenum: The Lockrey Co., Lubricants Division, College Point 1, N. Y. — The manufacturer claims that the new molybdenum lubrication has now been made available in form suitable for use in any conventional lubricating system. The product is known by the trade name of Liqui-Moly. It can be used alone or added directly to crankcase or other oils which carry to the friction-surfaces where it "plates out" on the metal. It is said to provide a permanent low-friction anti-seizing coating. It is recommended by the manufacturer for extreme temperature conditions. Experimental quantities available at a nominal cost by writing the manufacturer.

Bearing Information: Anti-Friction Distributors' Association, 1900 Euclid Bldg., Cleveland 15, Ohio—A valuable booklet published by this association covering anti-friction bearing use and care may be obtained by writing the above.

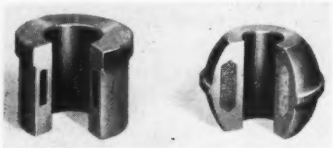


Lubri-King Unit: W. A. Horejsi Co., 2001 James Ave., N., Minneapolis, Minn.—A new coolant supply unit for use on small tools or bench employing a foot powered pump, is announced. A steel tank of two gallon capacity, five feet plastic hose, with a nozzle attachment. Fluid delivery controlled by pressure on pump. A 50 mesh screen is included for use where reuse of fluid is required. Combined weight of unit is less than 10 pounds empty. For additional details, write above company, attention Dept. LE.



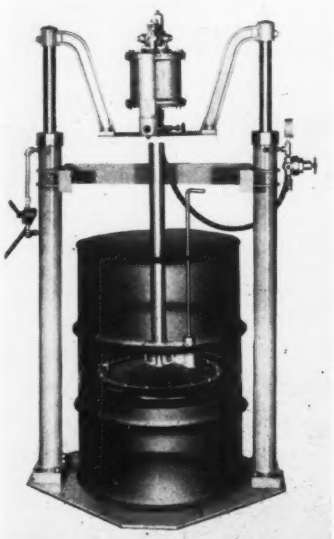
Drum Lift: The Elwell-Parker Electric Co., Cleveland 3, Ohio—This new device comprises a steel frame with base attached to elevating machanism in the truck's upright column. Not wider than the standard size 55 gallon drum. Handling capacity 1,000 lbs. Fully automatic in operation, synchronized gripping and supporting action is firm and secure. Drums can be lifted to a base height of 130 inches.

Oil-Impregnated Bearings: Michigan Powdered Metal Products Co., Inc., Northville, Mich.—The Haller Oil Well Bearing introduces a method of forming a cavity of uniform size in the center of a bearing wall. It is claimed by the manufacturer that the increased lubricating quality of the bearing together with a stronger bearing material makes it possible to carry heavier loads and practically eliminate freezing under the most adverse operating conditions. The new bearings are supplied in the pocket and sponge types for different conditions of use. The manufacturer states that they are particularly adabtable to a wide range of applications where conventional sintered bearings are normally used.



Rivett Acquires: Rivett Lathe & Grinder, Inc., Boston, Mass.—Announcement is made of the purchase of the entire line of Gerotor air and hydraulic valves, cylinders and hydraulic power units from Gerotor May Corp., Baltimore, Md. All manufacturing and selling operations of the line are being transferred to Boston. Gerotor May Corp. is retaining the manufacture and sale of Gerotor hydraulic pumps and fluid motors at Baltimore, Md.

Power-Operated Hoist: Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago 14, Ill.—This hoist and follower plate unit has been produced to handle materials that will not seek their own level. Exerting 6700 p.s.i., it assures positive prime and elimination of air pockets. It is claimed that it is particulary adaptable for lubricants, greases, caulking and sealing compounds. Fully automatic in operation.



MEN IN THE NEWS

Maj. A. E. CARPENTER

W. F. MacDONALD

New Officers—Houghton: E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.—At the February stockholders' meeting, William F. MacDonald was elected President. Mr. MacDonald became affiliated with the company in 1927 and has, since that time, served in various capacities. He succeeds Major Aaron E. Carpenter, who voluntarily relinquished the Presidency. Major Carpenter was elected Chairman of the Board of Directors, having been President since 1934, during which period the company's peace-time sales quadrupled. This company manufactures industrial oils, leathers and chemicals.

D. G. FAUST

Norgren Appoints: C. A. Norgren Co., 222 Santa Fe Drive, Denver 9, Colorado—Mr. Delbert G. Faust has been appointed Chief Engineer of the above company. Mr. Faust has an extensive engineering background and, in his new capacity, will be in charge of all research and engineering activities in the development of new and improved oil fog lubricators, pressure regulators, air filters, relief valves and other pneumatic products in the Norgren line.

Magie Announces: Magie Brothers, Inc., 1640 Carroll Ave., Chicago 12, Ill.—Mr. Sam W. Bodman, Jr. was recently appointed Sales Manager of the Industrial Lubricants Division for the above company. Mr. Bodman has been active in the metal working and foundry trade during the past 16 years in the midwestern and eastern industrial areas. Mr. A. I. Thuren was appointed representative for this company in the South Chicago and Northern Indiana ter-

(*Continued on page* 95)

Welcome to New Sections

YOUNGSTOWN

For some time a number of A.S.L.E. members affiliated with the Cleveland-Youngstown Section felt that the Youngstown area would support a Section of its own. These members, after due consideration and much preliminary work, set the night of January 17th for an organization meeting. Mr. Charles L. Pope, President, and Mr. W. F. Leonard, Secretary, attended, along with several out-of-town guests (members of A.S.L.E.) who were in Cleveland at the time for the Plant Maintenance Show. The Cleveland group cooperated to the fullest extent in the formation of the Youngstown Section. There is an excellent nucleus of A.S.L.E. members in the Youngstown area and the Chairman of the Membership Committee, Frank W. Hampton, predicts a good increase in membership before the April Convention. We are happy to add another Section to our growing list and our congratulations to these wide-awake members of A.S.L.E.
(See Section Officers' Page)

NEW JERSEY

At the request of a number of men who are interested in the subject of lubrication, an organization meeting was held on Thursday evening, February 23rd, at the Essex House in Newark, New Jersey. National Secretary, W. F. Leonard acted as Chairman and after much preliminary discussion, it was voted to form a New Jersey Section. There was a great deal of enthusiasm displayed in the formation of this new group and we predict a large increase in their original membership. The election of Officers was held immediately and plans were made for an early technical session, at which there will be a membership drive. We welcome this new group to the ever-increasing Sectional activities and we can foresee a rapid growth.

Officers elected:

Chairman: W. V. Cook, American Can Company.
Vice Chairmna: D. A. Butler, Fiske Bros. Ref. Co.
Sec'y-Treas.: V. A. Carrougher, Alemite Co., Newark.

FORT WAYNE

In February, Mr. Howard O. Bennett, Lubrication Engineer of the Standard Oil Company for the Chicago area, assisted by Mr. John Stack, also of Standard Oil, discussed "Ball Bearing Lubrication". Members of the American Society of Mechanical Engineers attended this session as guests and between the two groups, an unusually interesting evening developed.

MILWAUKEE

Many problems on "Electric Motor Bearing Lubrication" were brought to the January meeting. This was held as an open forum and proved very successful and informative presented in that manner.

CHICAGO

Mr. T. P. Sands, Chief Research Chemist of the Monsanto Chemical Co., St. Louis, Mo., addressed this Section on the subject of "Additives For Lubricants", at the February meeting. Mr. Sands' background more than qualifies him to discuss this topic and it was felt that his presentation was very informative. All of the meetings of the Chicago Section are preceded by a sponsored cocktail period which is not only enjoyable but allows for social intermingling of members and guests.

CONNECTICUT

"Ball Bearing Lubrication," by Mr. C. R. Gillette, Chief Chemist of the New Departure Division, GMC, was the theme of the January meeting of this group. Mr. Gillette was former Chairman of the Section and his talks are always outstanding. We liked the reminder of the 5th Annual Convention which appeared on the meeting notice sent out by the Section.

TWIN CITIES

An interesting evening was spent in January with Mr. E. H. Erck of the Eclipse Pioneer Division, Bendix Aviation Corp., who spoke on the subject "Lubrication of Airborne Accessories and Instruments". The usual question and answer period followed.

BUFFALO

This Section greeted Mr. W. McKaig of I.B.M. at their February meeting. His presentation of "Lubrication at I.B.M." brought out many ideas that are of importance to the overall subject of lubrication.

DAYTON

"Ball Bearing Lubrication," by C. R. Gillette, Chief Chemist, New Departure Division, GMC, was a recent presentation at the above Section. Secretary H. L. Sellers submitted the following digest: "Mr. Gillette's opening statement was that one of the functions of the lubrication engineer is to maintain these bearings in a condition which will secure optimum results. Exact knowledge is available for the performance and life of the bearings under all conditions of load and speed. Normal termination of ball bearing life is through fatigue failure only. Premature failure of ball bearings can be attributed to four major causes:

1. Abnormal loading, misalignment, incorrect housing and shaft fits, vibration, etc.
2. Wear caused by abrasive matter contained in dirty lubricants, or which finds its way into the bearing because of inadequate seals or from lack of sufficient cleanliness in assembly operations.
3. Corrosion from condensation or wet conditions and from corrosive atmospheres.

4. Inadequate lubrication.

The principal requirements of a ball bearing lubricant are therefore:

1. To provide a lubricating film between balls and separator and sometimes between separator and inner ring.

2. To help dissipate any heat that may be generated in the bearing.

3. To prevent rusting or corrosion of the bearing parts.

4. To help protect the bearing from dirt, water, acid fumes or foreign matter of any kind. Considering the range of speeds and operating temperatures, Mr. Gillette pointed out several factors which would govern the use of oil or grease as a lubricant. He also reviewed the methods used in lubricating ball bearings. One of the main points to be considered in the lubrication of ball bearings is the limitation of the lubricant itself. For example, in addition to furnishing lubrication, the lubricant is often called upon to supply one or more other characteristics. In closing, Mr. Gillette discussed the various types of greases; i.e., calcium, barium, strontium, sodium, lithium, silicone and Di-ester grease. The usual question and answer period was of great interest to members and guests." We wish to comment editorially on the excellence and thoroughness of the report sent in by Secretary Sellers. More reports of this type from other Sections would react to the benefit, not only of the readers of our JOURNAL, but also assist the Program Chairmen in the selection of papers to be presented before their respective Sections. (See also reports of the Los Angeles and Philiadelphia Sections)

BOSTON

A new Secretary, Leroy S. Harris, was appointed to complete the term of office originally held by H. W. Skidmore. (See Section Officers' page.) Mr. Skidmore submitted his resignation because his company had scheduled extensive traveling for him. This group felt itself very fortunate in securing Mr. W. G. Perriguey, Lubrication Expert of Esso Standard Oil Co., New York City, to present "Varieties of Motor Oils — 1950" before their January meeting. His subject was ably presented. As an addition to the evening, the film "Desert Venture" was shown which covers the development of the Saudi-Arabia Oil fields by Aramco.

PITTSBURGH

At the January meeting, a motion was passed that a Board of Directors be established, consisting of the three past Chairmen of the Section and three additional members, whose function it would be to meet with the present officers and to counsel and advise on matters pertaining to the Section. In this way, the knowledge and experience of men who have served in the past will be available and certainly aid any incoming group materially. The guest speaker at this meeting was Mr. R. G. Call, who is in charge of the General Laboratory of the American Gas & Electric Co., Power, W. Va. His talk on "Transformer Oils" brought forth an enthusiastic discussion period. Mr. Call is active on numerous Committees and has written several papers pertaining to his subject. After the discussion period, "a light snack" of coffee and doughnuts was enjoyed, and served with the compliments of the Esso Standard Oil Co. and the Sun Oil Co. "Diesel Engine Lubrication" by Mr. E. B. Nugent of Sun Oil Co. was the topic at the February meeting. This choice of subject matter held the interest of the audience. Thanks to Secretary Semler for the above report.

PHILADELPHIA

We present to our readers an excellent job of Section reporting by Secretary William Eismann, Jr., of the above group's January meeting. "Mr. A. J. Zino, Jr., of the Swan-Finch Oil Corp. and Eastern Regional Vice President of A.S.L.E., attended as a guest and reported on the financial status of the Society. Plans are already being made for the 1951 A.S.L.E. Convention at which the Philadelphia members will act as hosts. Mr. William P. Kuebler of Westinghouse Electric Corp. was appointed Chairman of the Convention Committee. He, in turn, appointed the following members as Chairmen of their respective Committees:

Reception Committee: M. S. Terwilliger, Shell Oil Co.
Entertainment Committee: J. H. Richards, Jr., Apex Alkali Products.
Publicity Committee: C. H. Foster, Atlantic Refining Co.
Finance Committee: Frank Ross, E. F. Houghton & Co.
Representative on National Program Committee, M. A. Dewey, E. I. DuPont Co.

The business meeting was followed by a fine presentation by Mr. D. G. Espey, Sales Engineer, Esso Standard Oil Co., on 'Additives—Their Role in Industrial Lubrication.' Mr. Espey traced the history of additives from 1861 when the U. S. Patent No. 22,464 stated that 'a superior lubricator for machinery is prepared by adding salt, salt peter, unslaked lime, bar soap and water to rock oil or mineral' through the usage of 'compounded' oils and up to the present day lubricants which may contain as high as three or four synthetic additives. He covered the following classes of additives: Oiliness agents, Extreme Pressure additives, Pour depressants, Viscosity Index Improvers, Oxidation Inhibitors, Corrosion Inhibitors, Detergents, Tackiness agents, and Antifoam agents. In each instance, Mr. Espey explained the need for each type of additive, how its effect on the lubricant could be measured in the laboratory and where benefits from the additive were obtained by industry. It was pointed out that in nearly all cases the addition of an additive to a lubricant has to be made by the compounder because each base oil reacts differently to additives. Before lubricants containing additives are put on the market, a tremendous amount of research work is done to establish both the optimum type and concentration to be used, according to laboratory tests. It is then necessary to establish correlation between laboratory test methods and service performance of the oil. This work is best done by the suppliers because they can utilize the results over much broader fields. Mr. William Kesler, Research Chemist, Crown Cork & Seal Co., then led a spirited discussion on the subject. The extreme pressure lubricants and measurements of their E. P. properties were discussed at considerable length. A great deal of emphasis was also placed on the care which must be exercised in attempting to predict results in service on the basis of results obtained with laboratory tests."

LOS ANGELES

The January meeting of this Section was outstanding, due not only to the speakers and their subjects, but also to the preparatory work by Mr. G. A. Zamboni, Chairman of the Program, Planning and Publicity Committee. The first meeting notice was followed by a reminder and brought out an attendance of 100 members and guests. The theme was the discussion of an actual lubrication problem, its cause, and solution. This was ably covered by a panel consisting of two represent-

atives from the suppliers of lubricants, Mr. J. F. Snider of Standard Oil Co. of California and Mr. M. A. Wise of General Petroleum Corp., and two representing the users of these products, Mr. Charles Wallace of Allis-Chalmers Mfg. Co. and Mr. D. H. Moreton of Douglas Aircraft Corp. Secretary Perso's report was so complete that we quote:

"The meeting was presided over by Mr. M. H. Sperling, who introduced each speaker and directed the question and answer period. Mr. Moreton discussed problems encountered in lubrication of equipment which pressurized aircraft cabins, such as that of bearing erosion. This condition was overcome by establishing means for the oil to escape more readily from the bearing. The problem of fretting corrosion on the splines on the drive shaft of the Turbo-Chargers has not been solved at this time, said Mr. Moreton. Mr. Snider brought out two problems of lubrication which have been solved in his company. The first was the lubrication of Mono-Rail conveyor systems operated in automobile assembly plants. With ordinary lubricants, it was found that bearings would sieze and fail prematurely. A mixture of penetrating oil plus finely ground graphite shot inside the bearing through a Zerk fitting, eliminated the grease leakage and premature failure of the rollers and also the excessive drag on the drive mechanism. The second case discussed was the over-use of glycerin injected into the cylinder of gas driven compressor engines causing black deposits to accumulate on the cooler parts of the piston skirts. Too much glycerin placed in the chambers forces the glycerin into the engine when it is started up, thus causing the piston skirt deposits and possible scratching of cylinder walls. Mr. Wallace gave a fine talk on 'Electric Motor Lubrication', pointing out the dangers of over-lubrication, especially of anti-friction bearings. He brought out the necessity and importance of stepping up maintenance schedules for servicing these motors to eliminate costly bearing failures or high maintenance costs. Instances were cited of oil leakage from ring oiled bearings caused by the plugging of the small oil vent in the sight oil level gauge. With the oil vent closed, the proper oil level in the bearing is not indicated by the oil guage, thus bringing about an overflow. Mr. Wallace cautioned against the filling of the bearings while the unit is in operation since the gauge will not indicate the proper oil level in the reservoir. Mr. Wise presented an interesting explanation of problems encountered in furnishing the proper lubricant for the Horseshoe bearings which are used to float the 200-inch mirror in the Hale Telescope at Mt. Palomar. Though mercury is occasionally used for this purpose, it has proved expensive due to the fact that it is necessary to change it often. The General Petroleum Corp. developed a lubricant with an extremely high V.I. and anti-corrosive properties and an S.A.E. 30 viscosity, which adequately serves the purpose. Another case was cited by Mr. Wise of the difficulty with lubricating bearings on a steel strip mill. The trouble was caused by soluble oil used as roll oil getting into the lubricating oil, causing sludging and corrosion. A centralized lubrication system was installed and the bearings were converted to a grease lubricant, thus eliminating the contamination because grease seals the bearings. A large reduction in lubrication cost resulted. The meeting was considered extremely informative and it is hoped to repeat one similar to it at a later date." Mr. Perso's complete discourse is a valuable contribution to all readers.

NEW YORK

Secretary C. C. Goehring sent to the National office a list of topics presented at their past meetings. The Program Chairman, Mr. E. Hale Codding of Tide Water Associated Oil Co. arranged the program and the Secretary reports that all sessions have been enthusiastically attended and the technical discussions were interesting and informative. We are publishing the list as sent in to illustrate how a diversified schedule can be set up, thus presenting a well rounded program which will apply to the various phases of lubrication and appeal to the divergent interests:

September 21, 1949

"Additives for Lubricating Oils," by Dr. C. L. Fleming, Jr., Standard Oil Development Co.

November 9, 1949

"Fluid Drives for Industrial Applications," by Mr. R. G. Olson, American Blower Corp.

December 14, 1949

"Diesel Engine Developments," by Mr. J. C. Barnaby, Worthington Pump & Machinery Corp.

January 25, 1950

"A Comparison of Compressor Lubricants," by Mr. K. L. Hollister, The Texas Company.

February 15, 1950

"Preventing and Fighting Petroleum Fires," by Capt. H. J. Burke, C-O-Two Fire Equipment Co.

Mr. Goehring laid stress on the fact that the membership drive in New York is gaining momentum because of the inspirational program given.

BALTIMORE

We are proud to submit to our readers yet another Section report that is stimulating and informative, meeting the need of good editorial content. We quote Mr. V. A. Ryan, a Director of A.S.L.E. and Chairman of this Section's Programs and Meetings Committee:

"At this particular time the Baltimore Section wishes to announce that the principal speaker at its Annual Business Meeting and Banquet, which will be held Saturday evening, May 20, 1950, will be the famed Lecturer and Educator, Florence Conrath Wilmer, who is presently Chairman of the Department of History at the University of Baltimore. Mrs. Wilmer will talk to us on the World Government Movement under the title of 'World Government and What You Can Do About It.' Since the Annual Banquet is our only meeting of the year which is graced by the presence of the fair sex, we feel highly honored in having Mrs. Wilmer add to it the charm and dignity of a woman speaker.

We have now completed our Winter Season—in what the members call a blaze of glory—having held two meetings with a total attendance of 167 members and guests which is the highest record for the Section since its inception.

In January, Mr. Charles R. Hand, Assistant Superintendent of the Mechanical Department of Bethlehem Steel Company at Sparrows Point, Maryland presented a paper on 'Maintenance and Lubrication in Steel Plants.' Mr. Hand's talk was concerned with the various phases of lubrication and the problems relating to its application in steel plant maintenance. It covered such changes as had to be made in bearings and other machine parts in order to provide better lubrication than that obtainable in the original machine design. Diagrammatic details of these changes were illustrated by slides showing the complete departure from the original design that was employed in improving the performance of various mills and. particularly, rolling mills. Slides

(*Continued on page* 95)

CURRENT LITERATURE

Industry and Power, June, 1949

SET UP SUCCESSFUL PROGRAM FOR PREVENTIVE MAINTENANCE
Mamer, L. J.—pp. 89-91

Detailed yet concise information is supplied on just how a highly successful preventive maintenance program was developed so that new and better methods are constantly being found, troubles avoided, impressive savings accomplished and interest of crews maintained.

Institute of Petroleum Review, Vol. 3, No. 32, August, 1949

THE EUROPEAN RECOVERY PROGRAM AND THE FUTURE OF OIL IN WESTERN EUROPE
Rhodes, J. D. E.—pp. 225-229

At the end of December, 1948, the Organization for European Economic Co-operation (O.E.E.C.) submitted to the Economic Co-operation Administration (E.C.A.) in Washington a report which is of particular interest to those engaged in the petroleum industry. It was concerned with the co-ordination of the program to be followed by the nineteen participating nations in their effort to achieve economic independence by 1952-3. Having indicated the origins of the dollar shortage and reviewed the post-1939 war situation, the author outlines the European recovery program and, in connection with this program, the situation of the petroleum industry in Western Europe.

THE THIRD WORLD PETROLEUM CONGRESS
Anon.—p. 229

It is announced that the third World Petroleum Congress will be held in the Netherlands during May or June, 1951, and will be organized by the Petroleum Section of the Netherlands Royal Institute of Engineers. The purpose of the Congress is to provide an opportunity for the scientific discussion of all technical subjects pertaining to the petroleum industry or allied to it.

SIGNIFICANCE OF PROPERTIES OF PETROLEUM PRODUCTS. II. FLASH-POINT AND INFLAMMABILITY OF PETROLEUM PRODUCTS
Evans, E. B.—pp. 231-234

The flash-point test is very widely used, in conjunction with other tests, to classify and characterize petroleum oils and mixtures thereof and, in particular, as a guide to the fire hazards associated with their use and storage. The author in this second part of his paper discusses the closed and open flash-points, fire-point, lower and upper flash-points, and spontaneous ignition temperature.

METRIC OIL MEASUREMENT TABLES
Anon.—pp. 251-253

A conference was held in Brussels on June 8-9, 1949, which has cleared up all outstanding questions relating to the production of metric oil measurement tables. The recent meeting in London between ASTM and Institute of Petroleum representatives also finally cleared up all outstanding points relating to the proposed joint book of Oil Measurement Tables. Once the formal approval of ASTM D-2, Division of Measurement and Sampling has been obtained, the work of computation and production can proceed.

The Institute Spokesman, Vol. 13, No. 5, August, 1949

THE PHASE STUDY APPROACH TO GREASE PROBLEMS
Vold, M. J. and Vold, R. D.—pp. 10-14

The properties of a given grease, particularly its behavior on heating, may depend quite critically upon its phase behavior although many properties will depend also upon the colloidal structure. The authors attempt to investigate the phase behavior of greases. Sodium, calcium and lithium soaps are taken up and experimental methods for phase studies of greases, the phase behavior of anhydrous soaps in hydrocarbons, the effect of additives, and relations between phase behavior and grease properties are covered.

Vol. 13, No. 6, September, 1949

RECENT DEVELOPMENTS IN ALUMINUM STEARATES
Parker, K. and Wagner, E. F.—pp. 10-11, 15

Development of aluminum stearates specifically for the grease industry is described. Test results are presented on greases prepared with four typical base oil stocks. The economy, stability and handling of high yield aluminum stearates are discussed. Objectives of future development work are given along with the suggestion of much closer technical cooperation between grease and stearate manufactures for their mutual benefit.

ALUMINUM STEARATE 22-G
Witco Chemical Co.—pp. 12-13
SYNTHETIC — 100-EXTREME JELL ALUMINUM STEARATE
Synthetic Products Co.—p. 18

These pages give advertisements of the companies mentioned on aluminum stearate, its properties, etc.

SEVENTEENTH ANNUAL MEETING — NATIONAL LUBRICATING GREASE INSTITUTE—NEW ORLEANS
Papers presented—pp. 16-23

The following papers are listed:

"A New Approach to Lubricating Grease Structure," Browning, G. V.
"Plant for Continuous Grease Manufacture," Bloomsburg, H. E., and Beerbower, A.
"The Effect of Water and Other Additives on the Fiber Structure of Calcium Soap Greases," Farrington, B. B.
"Lubrication—Then and Now," Harris, E. R.
"Bentone Greases," Finlayson, C. M., and McCarthy, P. R.
"Specific Fatty Acids and Glycerides for Lubricating Greases," Graziani, O., Haas, F. C., and Hetchler, J. D.
"Industrial Grease Selection," Pope, C. L.
"Lubrication of Electrical Rotating Apparatus," Sumner, G. L.
"Reducing the Cost of Bus Maintenance," Gale, S. F.
"Twister Ring Greases," Roehner, T. G.
"Operation Grease Ball," Klein, N. L., and Kelley, C. W.
"Improvements in Aluminum Stearate for Grease Manufacture," Young, W. A.

Journal of Applied Physics, Vol. 20, No. 1, January, 1949

THE INCREMENTAL FRICTION COEFFICIENT—A NON-HYDRODYNAMIC COMPONENT OF BOUNDARY LUBRICATION
Burwell, J. T. and Strand, C. D.—pp. 79-89

In investigations of lubricated sliding friction between two crossed cylinders it is found that for hard, smooth surfaces the friction force is a straight-line function of the applied load, although this line does not generally pass through the origin. The slope of this line defines a friction coefficient, designated as the incremental friction $f\Delta$, which is thought to have certain advantages in the study of non-fluid lubricated friction. It is obviously independent of the load. It is found to be independent of viscous fluid effects and hence permits investigation of non-fluid friction at reasonable speeds.

Journal of Chemical Physics, Vol. 17, No. 6, June, 1949

STATISTICAL MECHANICS OF ADSORPTION. V. THERMODYNAMICS AND HEAT OF ADSORPTION
Hill, T. L.—pp. 520-535

The thermodynamics of an adsorbate on an inert adsorbent is discussed in some detail. Heats of adsorption are given particular attention in an attempt to clarify and extend the available methods in this field.

ON THE MECHANISM OF VISCOSITY OF LIQUIDS
Telang, M. S.—pp. 536-540

A new viscosity-temperature relationship for liquids has been derived, and its application has been studied.

Journal of the Institute of Petroleum, Vol. 35, No. 304, April, 1949

LUBRICATING OIL SYNTHESIS BY THE ALKYLATION OF NAPHTHALENE
Kobel, H.—p. 147A
(Erdol u. Kohle, Vol. 1, 1948—pp. 308-318)

Synthetic lubricating oils are manufactured by the Friedel-Crafts condensation of chlorinated Fischer-Tropsch naphtha with naphthalene using 1% of a suitable catalyst (not further specified). The overall yield of oil is 87% on the total hydrocarbon charging stock. Investigations were made on the composition of the synthetic lubricating oil by fractionation (0.05 millimeters) into cuts whose Raman spectra, molecular weight, and viscosity were measured.

SUNBURY LUBRICATING OIL TEST ENGINE
Crowther, J. R., Pitkethly, T. E. and Stansfield, R.—pp. 245-258

The testing of lubricating oil in engines is discussed. The requirements a testing machine should satisfy are considered. The Sunbury testing machine is described and its general assembly is presented.

NEW FORM OF VISCOMETER FOR TRANSPARENT LIQUIDS
Elkarim, A. A.—p. 144A
(Rev. sci. Instrum., Vol. 19, 1948—p. 833)

The apparatus consisting of a capillary tube entering the base of a glass cell which contains the test liquid, is described. Equation for calculating viscosity is presented. Viscosities of glycerine and methyl salicylate are reported.

CONVERSION FROM EMPIRICAL TO ABSOLUTE VISCOSITY SCALE
Brunner, M.—pp. 144A-145A
(Schweiz. Arch. Ang. Wiss. Tech., Vol. 15, 1949—pp. 31-32)

A plea for the abandonment of the Engler scale and transfer to kinematic viscosity units, is presented. A conversion table is included.

SOME OBSERVATIONS ON FACTORS AFFECTING THE STRUCTURE OF CALCIUM SOAP LUBRICATING GREASE
Sproule, L. W. and Pattenden, W. C.—p. 147A
(Canad. J. Res., Vol. 26F, No. 11, 1948—pp. 465-468)

The effect of the presence of water and of the shearing forces present during manufacture on a calcium-soap dispersion in mineral oil has been determined by electron-microscope observations.

PROTECTIVE GREASE FOR THREADS EXPOSED UNDER CORROSIVE CONDITIONS
Cohen, M., Halferdahl, A. C. and Puddington, I. E.—p. 152A
(Canad. J. Res., Vol. 26F, No. 8, 1948—pp. 347-348)

A steel plate ¼-inch thick was drilled and tapped to take ½-inch bolts, and the bolts and nuts treated with various oils and greases. After severe corrosion tests, the bolts treated with an inhibited aluminum stearate grease were the most easily turned. The composition of the grease is indicated.

Vol. 35, No. 305, May, 1949

THIXOTROPIC BEHAVIOR OF PETROLEUM JELLY
de Waele, A.—p. 181A
(Nature, 1949, Vol. 163—p. 248)

INTERNAL COMBUSTION MOTORS AND OIL INDUSTRY
Hohmann, H. M.—p. 190A
(Voodrachten Koninklijk Instituut van Ingenieurs, 1949, Vol. 1—pp. 1-100)—Drilling)

PETROLEUM A RAW MATERIAL FOR CHEMICAL INDUSTRY
Boot, J. C. G.—p. 190A
(Chim. et Ind., 1949, Vol. 61—pp. 229-234)

Chemical raw materials from petroleum are classified as those already present in the crude (e. g., hydrogen sulfide, naphthenic acids, aromatics), primary materials (e. g., products obtained by cracking and dehydrogenation) and secondary materials (e. g., olefins). Brief notes regarding the principal members of each group are given, together with production statistics (for the U.S.A.) for some of the main compounds.

LUBRICATING OIL TESTS
Downs, D. and Pigneguy, J. H.—p. 183A
(Automobile Engineer, Feb., 1949, Vol. 39 (511)—p. 51)

Methods of assessing performance of oils in road-vehicle engines by accelerated laboratory engine tests are discussed. The use of additive-type oils, heavy duty for diesel engines and lighter duty "premium oils" for less arduous duties in gasoline engines, and their testing on a merit-rating basis has been developed.

RECENT DEVELOPMENTS OF THE PETROLEUM INDUSTRY
Schmitz, P. M. E.—p. 191A
(Chim. et Ind., 1949, Vol. 61—pp. 179-183)

LUBRICATION OF LAND AND MARINE OIL ENGINE. 2.
Anon.—p. 185A
(Scientific Lubrication, Jan.-Feb., 1949, Vol. 1—pp. 17-20)

CORROSION PREVENTIVES AND THEIR ASSESSMENT
Samuel, D. L.—p. 185A
(Scientific Lubrication, Jan.-Feb., 1949, Vol. 1—pp. 2-4, 22)

MECHANICAL WEAR
Burwell, J. T., Jr.—pp. 185A-186A
(Nature, 1949, Vol. 163—p. 262)
(Conference held at Massachusetts Institute of Technology, Cambridge, Mass., June 14-16, 1948)

Topics presented at the meeting included laboratory and service experience on wear in internal combustion engines, steam-turbines, journal bearings, gears, and cutting tools. Some of the factors controlling wear were considered to be hardness, fatigue strength, gas adsorption, chemical reaction, and viscosity.

VAPOR BLAST AND ITS EFFECT UPON LUBRICATION
Anon.—p. 186A
(Scientific Lubrication, Jan.-Feb., 1949, Vol. 1—p. 16)

NEW INDICES FOR THE VISCOSITY-TEMPERATURE RELATIONSHIP OF LUBRICANTS
Gottner, G. H.—p. 186A
(Erdol u. Kohle, 1949, Vol. 2—pp. 17-23)

Vol. 35, No. 306, June, 1949

THE BEAKER-CORROSION TEST FOR LUBRICATING OILS
Matthews, F. W. H.—pp. 436-453

This paper describes a laboratory test for evaluating the corrosive potentialities of lubricating oils toward cadmium-nickel bearing metal. Experimental work is described, the object of which was to produce a test of suitable precision which at the same time would yield results correlating with those obtained by the Bristol single-cylinder Hercules engine test. The test finally adopted yielded repeatable results showing reasonable correlation with engine tests. The apparatus and procedure adopted are described fully, explanatory diagrams and photographs being included.

LUBRICANT FILMS
Smith, E. A.—p. 229A
(Airc. Prod., Vol. 11, No. 127, May, 1949—p. 173)

The article deals with protection against scuffing by the use of graphitic and bearing-metal films.

Journal of Petroleum Technology, Vol. 1, No. 9, September, 1949

PROGRAM. PETROLEUM BRANCH FALL MEETING, SAN ANTONIO, TEXAS, October 5-6-7, 1949
Anon.—pp. 9-19

PROGRAM. PETROLEUM BRANCH MEETING IN LOS ANGELES, October 20-21, 1949
Anon.—pp. 20-21

The programs of two meetings of the American Institute of Mining and Metallurgical Engineers (Petroleum branch) are presented. One to be held at San Antonio, Texas, on October 5-6-7, 1949; the other in Los Angeles, California, on October 20-21, 1949. Abstracts of papers to be presented are included.

Journal of Physical and Colloid Chemistry, Vol. 52, No. 8, November, 1948

THIXOTROPIC QUALITIES OF SOAP-HYDROCARBON SYSTEMS
Boner, C. J.—pp. 1383-1390

Soap-mineral oil systems containing soaps of monovalent metals are less thixotropic over a period of 70 min. than are such systems containing soaps of di- and tri-valent metals, the latter showing the greatest degree of thixotropy for short periods. Systems containing soaps of the metal of lowest atomic weight in a series are more thixotropic over an extended period than are systems containing heavier metals of the same series.

Vol. 53, No. 7, October, 1949

THE VISCOSITY OF SUSPENSIONS OF SPHERES
Robinson, J. V.—pp. 1042-1056

Several equations to express the viscosity of suspensions have been proposed. Most of them involve the use of arbitrary constants. The Arrhenius and the Einstein equations are taken up. Viscosity measurements were made on a rotational viscometer designed and manufactured by the Sun Chemical Co. of New York and described by Buchdahl.

Journal of Polymer Science, Vol. 4, No. 4, August, 1949

SOME REMARKS ON THE FIRST INTERACTION COEFFICIENT OF THE VISCOSITY-CONCENTRATION EQUATION
Eirich, F. and Riseman, J.—pp. 417-434

The problem of the relation between relative viscosity and concentration of colloidal or polymer solutions is discussed. During recent years attempts have been made to formulate a viscosity-concentration relationship. The method of Huggins, in introducing a factor k' into the equation involved as a hydrodynamic correction factor, is examined, and in particular the attempts to draw conclusions relating k' to the thermodynamic properties of the solution. An explanation is offered to correlate the experimental viscosity-concentration relationship and the change of solvent. A possible method for the actual calculation of concentration effects has been applied to the case of a suspension of spherical particles. Thirty references are given.

Journal of the Society of Chemical Industry, Vol. 68, No. 7, July, 1949

THE PROPERTIES OF SOME HIGHER POLYMETHACRYLIC ESTERS
Crawford, J. W. C.—pp. 201-208

The paper deals with examination or re-examination of a number of polymeric high methacrylic esters undertaken with a view to obtaining information on the influence of the alcohol alkyl chain length, and of branching in this chain on the properties of the polymer. Polymers have been examined of all the alkyl methacrylates up to the butyl series. Attempts have been made to explain differences in the properties of the polymers mainly on the basis of induction due to methyl group in the alcohol alkyl radicals.

Lubrication, Vol. 35, No. 9, September, 1949

LUBRICATION OF IRON AND STEEL SMELTING AND REFINING MACHINERY
Anon.—pp. 97-107

Lubrication was a chore in the steel plant when the machinery was designed with lubrication as an after-thought. In those days the value of seals was not realized. The iron and steel industry of today has reversed this thinking. The designers pioneered the trend toward antifriction bearings, the oil film sleeve type bearing on the back-up rolls, the enclosed (oil lubricated) reduction gear sets. The management realized that these refinements in design required refinements in lubricants. They purchased accordingly, from a Petroleum Industry equally as anxious to contribute to the production schedules demand. The average equipment is rough and massive and first glance would lead one to believe that lubrication is not a serious matter. But the operating mechanisms of these massive units must be accurately designed and machined, since they are so inter-dependent upon one another. In effect, the principle of good machine-work must be incorporated.

Vol. 35, No. 10, October, 1949

ROCK CRUSHING AND SCREENING; LUBRICATION FEATURES
Anon.—pp. 109-121

With the idea of protecting the moving parts of rock products machinery against the abrasive effects of dust, the builders of lubricating equipment studied the lubrication requirements of these heavy-duty machines along with the operating conditions. Then, in conjunction with the designers, the bearings, gears, seals, housings and means of lubricant application were perfected. Inside the back cover a

(*Continued on page* 88)

OILS AND LUBRICANTS PATENT ABSTRACTS

Printed copies of patents are available from the Patent Office at twenty-five cents each. Address the Commissioner of Patents, Washington, D. C., for copies and for general information concerning patents.

From Official Gazette—Vol. 630, Nos. 1, 2, 3, 4, 5; Vol. 631, Nos. 1, 2, 3.

Prepared by ANN BURCHICK

Lubricant—Patent #2,493,213—Mario S. Altamura, assignor to Socony-Vacuum Oil Co., Inc.
A mineral oil composition comprising a mineral oil fraction normally permitting rusting of ferrous metal surfaces in contact therewith in the presence of water, and normally susceptible to emulsion formation in the presence of water, having in admixture therewith a minor proportion, from about 0.01 per cent to about 1.0 per cent of triethyllead caproate.

Mineral Oil Composition—Patent #2,493,216—Henry G. Berger and Everett W. Fuller, assignors to Socony-Vacuum Oil Co., Inc.
An improved mineral oil composition comprising a viscous mineral oil fraction having in admixture therewith: a minor proportion, from about 0.2 per cent to about 10 per cent, of an oil-soluble metal sulfonate; a minor proportion, from about 0.1 per cent to about 3.0 per cent, of an oil-soluble, phosphorus-and sulfur-containing reaction product obtained by reaction of a phosphorus sulfide and a material selected from the group consisting of a dicyclic terpene and an essential oil predominantly comprised of a dicyclic terpene, at a temperature greaterthan 100°C.; and a minor proportion, from about 0.25 per cent to about 2.0 per cent, of an oil-soluble, phosphorus and sulfur-containing reaction product obtained by reaction of substantially one mol of phosphorus pentasulfide and four mols of oleyl alcohol at a temperature from about 125°C. to about 150°C. for a relatively short time.

Mineral Oil Composition—Patent #2,493,217—Henry G. Berger and Everett W. Fuller, assignors to Socony-Vacuum Oil Co., Inc.
An improved mineral oil composition comprising a viscous mineral oil fraction having in admixture therewith: a minor proportion, from about 0.5 per cent to about 10 per cent, of an oil-soluble, sulfurized metal carboxylate; and a minor proportion, from about 0.10 per cent to about 3.0 per cent of an oil-soluble, phosphorus-and sulfur-containing reaction product obtained by reaction of a phosphorus sulfide and a material selected from the group consisting of a dicyclic terpene and an essential oil predominantly comprised of a dicyclic terpene, at a temperature greater than about 100°C.

Marine Engine Lubricant—Patent #2,493,483—Charles E. Francis and Robert C. Jones, assignors to Shell Development Co.
A marine engine lubricant capable of forming stable emulsions when in contact with an aqueous medium comprising from 0.05 to 1% of a glyoxalidine selected from the group consisting of hydroxy alkyl- and amino alkyl-substituted glyoxalidines; from 0.01 to 1% of a metal sulfonate selected from the group consisting of an alkali and alkaline earth metal salt of an organic sulfonic acid, the organic radical thereof being selected from the group consisting of petroleum hydrocarbon and alkyl-substituted aromatic hydrocarbon radicals; from 0.05 to 1% of a partial ester of a poly-hydric alcohol and a higher fatty acid having at least 10 carbon atoms, said ester having at least one free hydroxy group; from 0.1 to 5% of a fixed fatty oil and the balance being mineral oil.

Lubricant Composition—Patent #2,494,341—Eugene Lieber, assignor to Standard Oil Development Co.
Process which comprises condensing 0.5 to 5 mols of an alkyl mercaptan having from 1 to 20 carbon atoms with 1 mol of an aromatic compound selected from the class consisting of aromatic hydrocarbon and hydroxy derivatives thereof, in the presence of a Friedel-Craft catalyst at a reaction temperature between the approximate limits of room temperature and about 400°F., sufficiently elevated to produce high molecular weight polymeric condensation products, hydrolyzing and removing the catalyst and recovering from the reaction mixture a high molecular weight substantially non-volatile condensation product.

Flushing Oil—Patent #2,495,030—James W. Starrett, assignor to Standard Oil Co.
A composition consisting of a catalytic reformed naphtha fraction having an ASTM distillation range of from about 300°F. to about 650°F., and comprising predominately of mono- and polymethylated aromatic hydrocarbons and from about 1% to about 20% of a phosphorus- and sulfur-containing reaction product of an olefin polymer having a molecular weight of about 150 to 50,000 and a phosphorus sulfide.

Compositions including a Hydrogenated Semi-drying Oil and Methacrylate Resin Mixture as a Lubricant—Patent #2,495,277—Victor A. Navikas, assignor to Armstrong Cork Co.
An extrudable cork composition mix which comprises a mass of cork particles, a binder therefor, and a lubricant coating the cork particles without substantial penetration into the body thereof, said lubricant including a mixture of hydrogenated cottonseed oils in which one oil has a melting point of about 98°F. and another has a melting point of about 140°F., and a bodying agent for the oils consisting essentially of a thermoplastic methacrylate resin having a molecular weight above 10,000 selected from the group consisting of polybutyl methacrylate, polymethyl methacrylate, and polypropyl methacrylate.

Mineral Oil Composition—Patent #2,495,478—Horace E. Redman, assignor to Socony-Vacuum Oil Co., Inc.
A mineral oil fraction containing a minor proportion, from about 0.1 per cent to about 10 per cent, of an oil-soluble, metal salt of an acidic, phosphorus- and sulfur-containing reaction product obtained by reaction, at a temperature within the range varying between about 100°C. and about 175° C., of a phosphorus sulfide and an amine selected from the group consisting of an alkyl-nuclear-substituted primary and secondary aromatic amine and an alkyl-N-substituted secondary aromatic amine, said alkyl substituent being characterized by at least about 10 carbon atoms.

High Temperature Ball Bearing Grease—Patent #2,495,651 — Richard A. Butcosk, assignor to Socony-Vacuum Oil Co., Inc.
An improved lubricating grease adopted for the lubrication of ball bearings, roller bearings, and the like at high temperatures comprising a major portion of a mineral lubricating oil and from about 15 to about 30 percent of an alkali metal soap of a fatty acid having an iodine number in the range of from about 60 to about 170, the grease having been compounded by incorporating the acid-containing ingredient in at least a portion of the oil, saponifying and then raising the temperature of the mix slowly to a temperature of from about 500°F. to about 540°F. followed by holding the temperature at that level for a period of at least about 20 minutes and sufficient to bring about substantial polymerization of the fatty acid component.

Stabilization of Perfluoro Oils—Patent #2,496,115—William B. Burford, III., and Clifford E. Weber, assignors to the United States of America as represented by the United States Atomic Energy Commission.
The process of stabilizing and removing chemically combined residual hydrogen from a perfluoro oil containing less than 1% of residual hydrogen which comprises subjecting said perfluoro oil to treatment with fluorine at a series of increasing temperatures from a base starting range of 60° to 150°C. to a maximum temperature lying between 250°C. and 315°C.

Process of Producing Oil Films — Patent #2,496,362—John E. Vallerie.
The process of providing an oil film on interior surfaces of an internal combustion engine prior to firing the same comprising the steps of atomizing plating oil; injecting said oil, under pressure, into the interior of the engine; applying a suction directly to an interior passage of the engine at a point remote from the point of injection and drawing said atomized oil through the passages of the engine; and turning said engine over a plurality of times by an outside source of power.

Rust-Inhibiting Lubricating Composition—Patent #2,496,798—Herman D. Kluge, assignor to The Texas Co.
A rust-inhibiting lubricating composition consisting essentially of an oleaginous liquid having lubricating properties as the predominant constituent, and 0.01-3.0% by weight on the basis of the oleaginous liquid of a tertiary dodecyl thiosuccinic acid sufficient to inhibit the formation on a steel specimen immersed in said composition in the presence of salt water of both ferric oxide rust, as well as a cream-colored powdery film which results from reaction of the iron with a n-dodecyl thiosuccinic acid, the said tertiary dodecyl thiosuccinic acid having the tertiary dodecyl radical linked through the sulfur atom to the carbon chain of the succinic acid between the carboxyl groups.

Mineral Oil Composition Containing a Thenylamine—Patent #2,497,067 — Howard D. Hartough and Sigmund J. Lukasiewicz, assignors to Socony-Vacuum Oil Co., Inc.
A mineral lubricating oil containing a minor proportion, effective to reduce corrosion of bearings, of a thenylamine selected from the group consisting of 2-thenylamine and di-2-thenylamine.

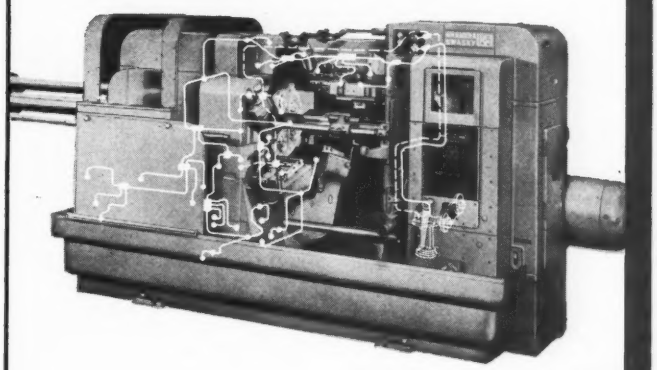
Lubricating Grease Compositions—Patent #2,497,133—Arnold J. Morway, Alan Beerbower and John C. Zimmer, assignors to Standard Oil Development Co.
The process of preparing a lubricating grease which is highly stable in severe mechanical working which comprises combining about 15 to 20% by weight of lithium stearate, about 1% of zinc naphthenate, 77.5 to 83% of di-2-ethyl hexyl sebacate, and 1 to 1.5% of antioxidant, stirring the ingredients to prepare a slurry, heating said slurry to a temperature substantially above the melting point of said lithium stearate to obtain a homogeneous solution, and rapidly and continuously chilling said solution to a temperature of about 80°F. simultaneously with severe mechanical working in layers of 0.005 to .25 inch in thickness.

Oil Compositions Containing Amine Salts of Boro-Diol Complexes—Patent #2,497,521—Chas. E. Trautman, assignor to Gulf Research and Development Co.
A composition of matter consisting essentially of a major proportion of a hydrocarbon oil and between about 0.001 and about 0.5 per cent by weight of the composition of an amine salt of an acid compound of boric acid and a member selected from the group consisting of glycols and polyhydroxy benzenes.

Drying Oils—Patent #2,497,890—Peter Kass and Joseph Nichols, assignors to Interchemical Corporation.
A process for improving the drying qualities of mixtures of tung oil with other drying oils which comprises refluxing the mixture with acetic anhydride at 160° to 180°C. and removing the acetic anhydride.

Your machines run smoother, longer...

THE WARNER & SWASEY COMPANY
Five Spindle Automatic Bar Machine



...on bearings oiled by an automatic system of "metered" lubrication

Your machines run smoother, longer and continuously on Bijur-oiled bearings.

Smoother because the correct oil film is constantly maintained by meter-units at the bearings. *Longer* because overall bearing wear is considerably reduced by positive control of oil flow. *Continuously* because a Bijur-equipped machine oils itself while running, eliminating down-time for lubrication.

These factors enable the user to boost production output, cut maintenance costs, and also lengthen the effective life of the machine.

Increased Production Output. A Bijur-lubricated machine oils itself while running, doing away with wasteful down-time for lubrication. Daily maintenance time is thus converted into more time for production.

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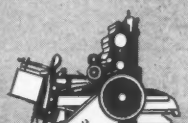
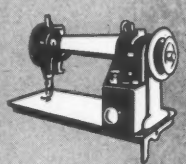


PRINTING PRESS
ATF "Chief Offset Press"



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Like these manufacturers, you too can "be sure with Bijur."

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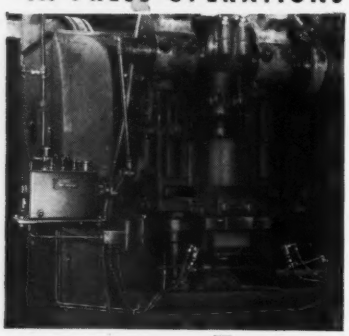
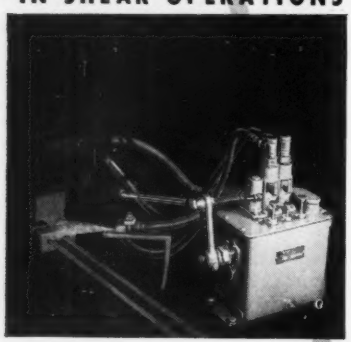
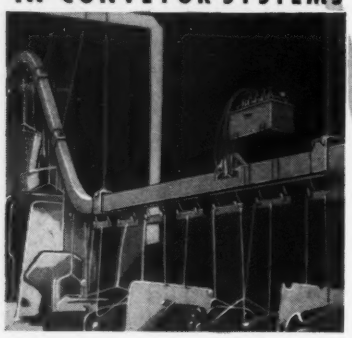


IN SHEAR OPERATIONS



IN CONVEYOR SYSTEMS



Dies, punches, and shear knives wear up to three times as long! Only 1/10 as much oil now being consumed! Punch breakage reduced, oil drippage eliminated! . . . These are typical comments of manufacturers using the new Manzel Automatic Spray System. And in every case the savings are out of all proportion to the modest cost of installing the system.

Manzel Spray Lubricators force automatically timed jets of oil spray directly onto the punches, shear knives, dies, rollers, or other parts. Compressed air and oil are fed simultaneously into a spray nozzle aimed at the critical area. The system is readily installed on any type of equipment, large or small. Write today for descriptive folder.

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DIVISION OF FRONTIER INDUSTRIES, Inc.

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Current Literature

(*Continued from page* 85)

table gives a simplified plan showing use of Texaco lubricants for rock products machinery.

***Mechanical Engineering*, Vol. 71, No. 9, September, 1949**

HOW CAN THE EFFECTIVENESS OF ENGINEERING EDUCATION BE IMPROVED
Hammond, H. P.—pp. 739-740

A summary of discussion of the effectiveness of engineering education at the Annual Education Conference of The American Society of Mechanical Engineers, New York, N. Y., March 21, 1949, is presented.

HYDRODYNAMIC OIL FILM
Boyd, J. Fuller, D. D., Shaw, M. C., Newkirk, B. L. and Roach, A. E.—pp. 761-765

Comments on the paper "The Load Carrying Ability of Hydrodynamic Oil Films," by Roach, A. E., which was published in the April, 1949, issue of this magazine (Vol. 71, pp. 293-296,326), are presented.

TECHNICAL DICTIONARIES
Anon.—p. 748

In the July 1, 1949, issue of this magazine, P. E. Erickson reviews the existing fifty technical multilingual and bilingual dictionaries, the majority of which (80%) were published before 1939. Certain desirable improvements are suggested.

National Petroleum Association — Preprint—Meeting of Department of Standards and Tests and of Department of Manufacture, at Esso Research Center, June 2, 1949

MOTOR OIL TRENDS
Tongberg, C. O.—19 pages

Discussing the functions of the lubricating oils in internal combustion engine, the author takes up two methods of improving engine condition, namely, frequent oil changes and the use of detergent oils.

Saturday News Roundup, July 2, 1949

MARTIN AND GAVIN OFFER BILLS TO TAX RECLAIMED OIL
Anon.—p. 4

Bills providing for a tax on reclaimed lubricating oils—now exempt from the six-cent federal tax on new oils—have been introduced in the Senate by Senator Martin (R., Pa.) and in the House by Representative Gavin (R., Pa.), Martin's bill provides for a six-cent tax and Gavin's for 4½ cents. Both bills would impose tax on the manufacturer, exempting oil reclaimed from journal-box packing of railway equipment and replaced in journal boxes.

47th Annual Meeting—September 14-16, 1949, Atlantic City, New Jersey

WORLD LUBRICATING OIL PRODUCTION CAPACITY AND ITS RELATION TO DEMAND
Keyser, P. V., Jr.—8 pp., 4 pages of tables

The world production of petroleum lubricating oils has never in the past, and will not in the foreseeable future, equal the maximum quantity of these products that could be produced from the crudes run. Refining facilities alone determine the maximum quantity of lubricating oils that can be made and this quantity always has been and will continue to be considerably below the potential in the crude. The essential nature of lubricating oil

(*Continued on page* 90)

In plant after plant... ONE superior lubricant serves ALL grease applications

That's a strong statement . . . hard to believe if you have been paying for a number of custom, special-purpose greases. Such custom greases are designed to fill just one or two special requirements.

But—Shell's new Alvania, a multi-purpose grease, can give you *all* of the desirable qualities, *in equal or higher degree. Check* these qualities...and remember that Shell Alvania grease has them *all:*

Pumpability even at low temperatures
Superior mechanical stability
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It all adds up—to more efficient lubrication . . . much lower inventory and application cost . . . *fewer* applications per year.

The Shell Lubrication Engineer will be glad to study your lubrication requirements, and to advise how you can enjoy the economies that many plants are now getting through use of this cost-cutting grease.

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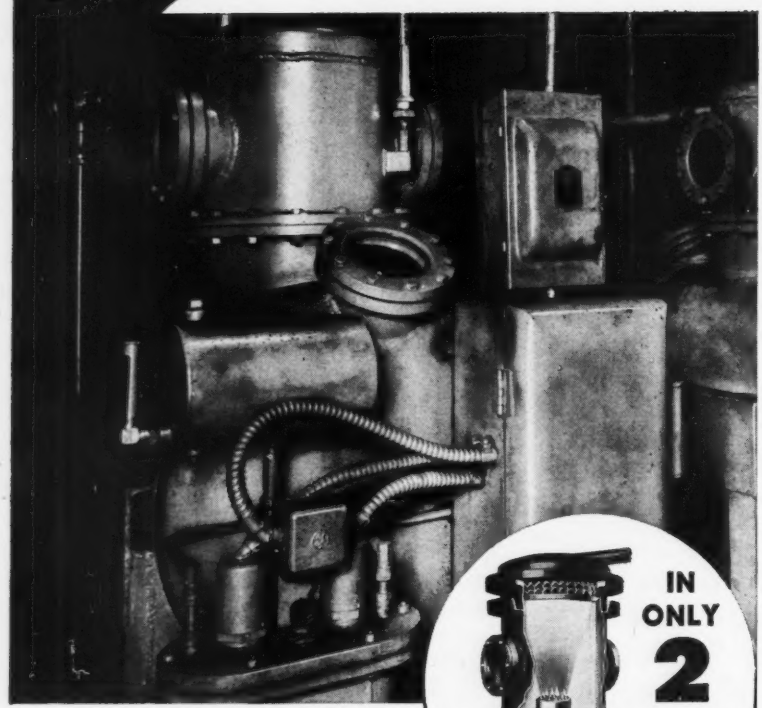
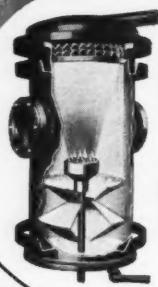
EXTRA DRY OIL *Cuts Costs*



Refrigerator oil degasifying installation



IN ONLY 2 SIMPLE STEPS

Refrigerator oils—not previously degasified or dehydrated—are used in bulk lots at reduced cost per gallon with Bowser degasifiers.

Bowser dehydration of sealing and lubricating oil enables vacuum pumps to pull down to 10 microns *without oil changes* and with only infrequent addition of make-up oil.

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This exclusive Bowser process also provides new highs in oil dryness and service life for cable oil, heavy duty bearing oil and many others.

It may be the answer to some of your problems. Write today for complete information.

1. **The Bowser method *atomizes oil into minute particles* to expose maximum surface area.**

2. ***Performs the atomizing operation in a high vacuum* to separate contaminants from the oil and to prevent their re-entry.**

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BOWSER, INC., 1358 Creighton Avenue, Fort Wayne 2, Indiana

LIQUID CONTROL SPECIALISTS SINCE 1885

(*Continued from page* 88)

and the great additional quantity of raw materials from which lubricating products could be refined will always be powerful forces to assure the facilities that will produce a supply at least equal to the demand. It is the intent of this paper to present a picture of world lubricating oil production capacity and to compare this with anticipated demand, using the year 1948 as a base and projecting both capacity and demand to the years 1950 and 1953.

National Petroleum News, Vol. 41, No. 4, January 26, 1949

INDUSTRIAL WAY LUBRICANT
Anon.—p. 38

New lubricant, called "Way Lubricant D," is designed for use on all kinds of industrial ways—hardened steel, chilled cast iron or new laminates—and is reputed to eliminate chattering and jumping effects that occur at the beginning of the tool stroke. Maker gives this description: Compounded with special additives; will not squeeze out or press out when machine is either in motion or standing still; non-corrosive to steel and copper and will not plug filters; possesses low static and running coefficients of friction and the required tackiness. (The Texas Company.)

Vol. 41, No. 29, July 20, 1949

LUBE OIL DISPENSER
Anon.—p. 31

Dispensing of bulk oil in desired measured quantities from drum to crankcase is the job claimed for a new dispenser. Designed to eliminate contamination in dispensing bulk motor oils, the unit fits standard drums with 1½-inch and 2-inch openings. It has a bung adapter which company (National Sales, Inc.) says assures a positive all-weather seal. Cap prevents the nozzle from dripping when not in use. No measuring devices are needed, because the equipment is designed to deliver a quart of oil with two strokes. A "breather" on the bung adapter equalizes pressure and temperature, preventing formation of moisture in the drum. It is located sufficiently high to prevent surface rainwater from seeping in.

Vol. 41, No. 39, September 28, 1949

OIL CHANGE INTERVAL SET BY 7 FACTORS, SAE TOLD
Anon.—p. 28

Speaking at a transportation and maintenance meeting of the Society of Automotive Engineers on September 12, 1949, J. J. Baadte discussed the following factors which determine oil drain periods: 1) engine temperature, 2) type of service the vehicle is required to give, 3) condition of the engine, 4) effectiveness of filtration, 5) type of fuel, 6) driver habits, and 7) quality of the oil.

OIL RESEARCH EXPENDITURES QUADRUPLED IN 10 YEARS
Anon.—p. 36

Petroleum industry is now spending $100,000,000 a year on research, almost four times as much as it did 10 years ago, Dr. Wayne E. Kuhn, chairman of the American Chemical Society's petroleum division and manager of the technical and research division of The Texas Co., reported in a statement at the opening of the society's 116th national meeting. Despite the steady increase of the cost of research petroleum prices in 1948 were only 20% above the 1926 level, as compared with a commodity price increase of 60%, a food price increase of 80%, and a building material increase of 100%.

Vol. 41, No. 45, November 9, 1949

LUBRICATING AND AUTOMOTIVE MEN REPORT ON USE AND MERITS OF 5W MOTOR OIL
Raviolo, V. G., Anglin, A. B., Georgi, C. W. and Mougey, H. C.—pp. 26, 27, 29-33

On November 3, 1949, at the SAE National Fuels and Lubricants Meeting in St. Louis, the Coordinating Research Council presented a report of its findings on 5W motor oil, the "5W" designating a motor oil meeting cold-weather operation specifications of automotive manufacturers but which has not yet been approved by SAE. On November 9, 1949, a Canadian Oil Company presented to the API convention at Chicago a report on its field experience with 5W motor oil. The partial texts of these two reports is given, as well as the partial texts of the discussions presented by C. W. Georgi and H. C. Mougey. Laboratory data, oil consumption, viscosity stability, cold starting, wear problem, controlled field testing, general marketing results, and limitations of 5W oil are covered. For complete list of papers presented before the API Division of Production, Division of Refining and Division of Transportation at the API 29th annual meeting, November 7-10, 1949, in Chicago, see Petroleum Engineer, Vol. 21, No. 12, November, 1949, pp. A-41—A-44, A-46—A-48.

Oil and Gas Journal, Vol. 47, No. 16, August 19, 1948

PROPERTIES OF HYDROCARBONS
Nelson, W. L.—pp. 121

The values of the properties of hydrocarbons are being revised so constantly that a new one is always in order. The two tables on this page give information for some common gaseous paraffins, olefins, and other gases. The critical viscosity data were taken from information and a correlation formula published by Uyehara & Watson (A Universal Viscosity Correlation, Nat. Pet. News, Tech. Sect., October 4, 1944). Most of the other information was taken mainly from "Physical Constants of the Principal Hydrocarbons" compiled by M. P. Doss of The Texas Co.

GOVERNMENT GRANTS FIRST SUBSURFACE STORAGE
Anon.—p. 147

The Interior Department recently announced the first agreement under legislation enacted in 1946, authorizing the department to permit the subsurface storage of oil or gas in order to avoid waste or to promote conservation of natural resources. Under the agreement, Michigan gas Storage Co. ultimately will store 15,000,000 to 20,000,000 M.c.f. (thousand cubic feet) of natural gas yearly in federal lands in the Winterfield and Cranberry Lake gas fields in Michigan. Most of the gas to be stored will be transported from Texas by Panhandle Eastern Pipe Line Co.

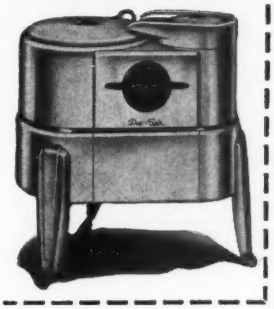
Vol. 47, No. 37, January 13, 1949

1947 LUBRICATING SALES BY STATES, TYPES REPORTED.
Anon.—p. 115

Automotive oils comprised 54 per cent of all oils sold in the United States in 1947 compared with 31 per cent for industrial lubricating oils and 14 per cent for other industrial oils. Aviation oils account for 1 per cent. This information was prepared by the Department of Commerce and the American Petroleum Institute through national survey of sales of lubricants, oils and greases by states and by types. Texas, California, New York, Pennsylvania and Ohio together consumed 32.8 per cent of the total, Pennsylvania leading all states in the consumption of industrial oils.

THIS LUBRICANT SAVES GEARS AND TRANSMISSIONS

—says **AUTOMATIC WASHER COMPANY** Newton, Iowa



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LUBRIPLATE Lubricants reduce friction and wear, prevent rust and corrosion, save power. Because LUBRIPLATE Lubricants last longer, they are more economical to use.

Let us send you CASE HISTORIES of the use of LUBRIPLATE Lubricants in your industry. There is a LUBRIPLATE product best for every lubrication need. They range from the lightest fluids to the heaviest greases. They are different from any other lubricants you have ever used. Write today for further information.

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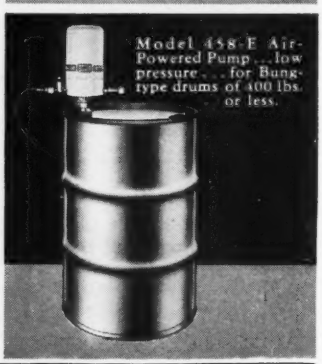
CUTS MAINTENANCE COSTS!

A complete line for industry–

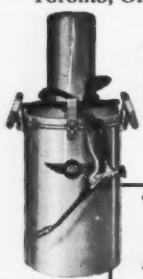
Correct lubrication is a *must* for the proper functioning of machinery in your plant! This means—use the right lubricants *and the right lubricating equipment!*

Do the job with Aro's expertly engineered complete line of lubricating equipment for top-speed and efficiency! Assures fast clean handling of lubricants . . . positive lubrication . . . with less labor and less waste . . . more production time for your machines . . . and lower maintenance costs! A few items in the Aro line are shown here. See your Aro Jobber or write . . . The Aro Equipment Corporation, Bryan, Ohio. Aro of Canada, Ltd., Toronto, Ont.

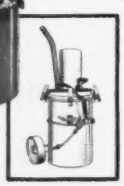
Model 51-DX twin cylinder High Pressure Lubricator . . . air-powered . . . for use with 100 lb. drums.



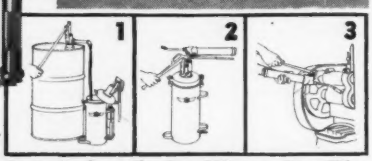
Model 458-E Air-Powered Pump . . . low pressure . . . for Bung-type drums of 400 lbs. or less.



Model 5685 Portable Lube Outfit ...1 lb. Lever Gun and 30 lb. Hand-Operated Gun Filler.



Model 5690 Air-Powered Lubricator . . . available with 2-wheel Hand Truck or dolly for easy portability.



Fast, clean handling of lubricants! 1—Transfer Pump loads 30-lb. Gun Filler; 2—Gun Filler loads 1-lb. Gun; 3—Gun applies lubricant.

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Silicone News

DC SILICONES

DC SILICONE GREASE Stops Bearing Failure IN OVEN CONVEYOR

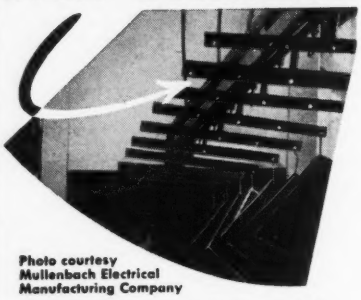

Photo courtesy Mullenbach Electrical Manufacturing Company

Conveyor line carrying freshly painted electrical equipment through 375° F. needs only two greasings a year with DC 41 Silicone Grease.

Burned out conveyor bearings and grease dripping on freshly painted electrical equipment were two major drying oven problems confronting engineers of the Mullenbach Electrical Manufacturing Co. of Los Angeles. At a temperature of 375° F., the best organic greases failed and weekly relubrication was essential to keep the conveyor system operating. Even then bearing failures were common.

Acting upon the advice of a Dow Corning sales engineer, Mullenbach cleaned and repacked the conveyor bearings with DC 41 Silicone Grease. Now, after more than two years of silicone lubrication, bearing failures are unknown. Relubrication twice yearly is all that is required to keep the conveyor working perfectly.

DC 41 Silicone Grease is being specified by more and more manufacturers to solve lubrication problems involving high temperatures. If such a problem exists in your plant and you'd like to know more about this heat resistant silicone lubricant, write today for data sheet No.N-15 or phone the branch office nearest you.

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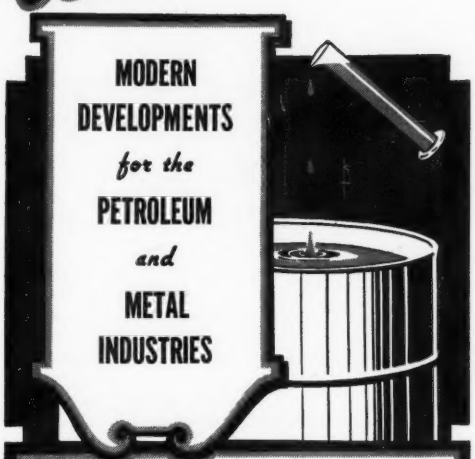

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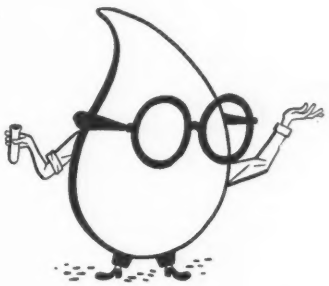

Greetings

You are cordially invited to visit the Texaco Exhibit, Booth No. 35, at the A.S.L.E. Lubrication Show at the Hotel Statler in Detroit on April 10, 11, and 12.

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*Denotes Residence Address Preferred.

Men In The News

(*Continued from page* 80)

ritory. Mr. Thuren has had 21 years experience in the lubrication field, the past 12 years of which have been spent in close contact with the foundry and metal working plants in his present territory. Mr. John Sipp was appointed representative for the above concern in the Central Chicago and Northern Illinois territory. Mr. Sipp has had 7 years experience in the metal working industry. The above gentlemen are all members of A.S.L.E. and have made many valuable contributions to our Society. We are sure their many friends wish them well in their new affiliation.

S. W. BODMAN, Jr.

A. I. THUREN

JOHN SIPP

News of the Sections

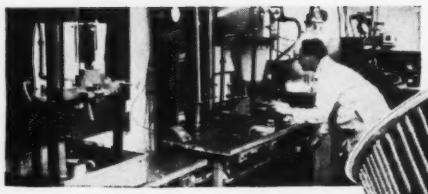
(*Continued from page* 83)

were also used to show the actual mills on which these changes were made. The bulk of the talk was devoted to a discussion of the results of the extensive studies which were required to make such changes, especially in cases where the equipment was large and the changes costly to make, and to the results of studies on bearing materials in general and, specifically, on composition bearings as applied to the roll necks of rolling mills. The final portion of the talk covered a slide—illustrated presentation of graphs and tabulated statistical data showing quantitatively that, after correct redesigning of equipment and proper application of the right lubricants, an immediate saving resulted in materials, maintenance labor, downtime and power consumption.

At the February Meeting, a paper on 'Some Fringe Problems in Lubrication' was presented by Mr. Alden Crankshaw, the Eastern Service Manager of Acheson Colloids Corporation in Port Huron, Michigan. Mr. Crankshaw's talk was prefaced by a short history of the development and production of colloidal graphite and then proceeded through a discussion of the established uses for colloidal graphited lubricants under extremely high temperature conditions such as those encountered in drawing tungsten filament, in vapor degreasing systems, in baking and annealing ovens, in hot strip mills, on plating machines, and around the valve stems and piston rods of steam locomotives. The talk continued with a presentation of the theory of the adsorbed boundary layer and the formation of the 'graphoid' film which was very effectively illustrated with slides. Slides were also used to show the particle size, coefficient of friction, and covering power of colloidal graphite in comparison with other materials in general use. The concluding portion of the talk was devoted to a description of the uses of colloidal graphited lubricants at normal temperatures in the general field of boundary lubrication involving, principally, air compressors, boiler feed pumps, and internal combustion engines, while mention was made of such additional uses as, on dies in the forging field and in the hydraulic press extrusion of aluminum tubing. Many actual case histories of all uses, both at normal and abnormal temperatures, were cited."

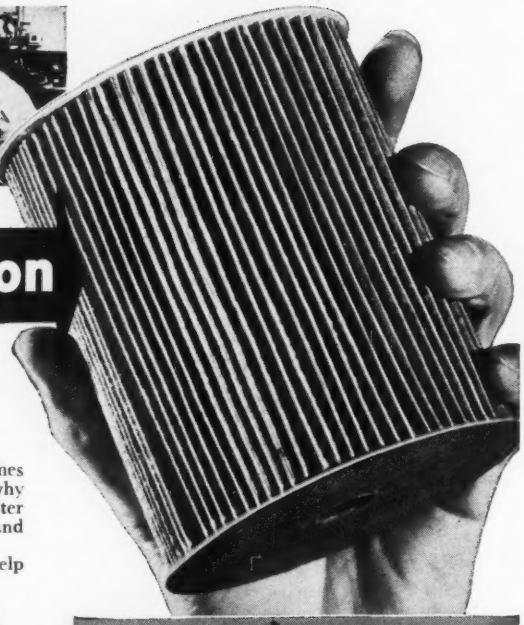
(*Continued on page* 97)

BECAUSE OF WHAT HAPPENS HERE...



Here's controlled filtration

...yours with the specially constructed accordion-type Purolator Micronic* Oil Filter



Constant laboratory checks assure the controlled porosity of the special plastic - impregnated cellulose from which Purolator Micronic Oil Filters are engineered. This, in turn, assures *controlled, uniform filtration* . . . oil cannot form channels and turn metal-chewing abrasives loose in your engine.

What's more — this special basic material is impervious to water, gas, and heat. Purolator Micronic cannot warp, distort or disintegrate. You save money on replacements.

Add the fact that a Purolator Micronic traps abrasive particles as small as 39 millionths of an inch. Plus — a filtering area up to 10 times that of ordinary filters. That's why Purolator Micronic is the oil filter you need to reduce down-time and engine and equipment repairs.

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(*Continued from page* 95)

YOUNGSTOWN

This is Secretary M. C. Jones' initiation into the News of the Sections feature of our JOURNAL for the Youngstown group. Based on this first complete report, we are sure his further efforts will receive a high rating among our readers.

"The first official meeting of this section was held February 28 with an attendance of 55 members and guests. E. H. Codding, Captain, U. S. Naval Reserve, of the Tide Water Associated Oil Co., gave an informative talk on 'Extreme Pressure Lubricants, Their Development and Utility in Industrial Lubrication.' Mr. Codding mentioned reasons for the development of these lubricants in both the automotive and industrial field. He described the different types of extreme pressure lubricants and enumerated their many industrial applications. Characteristics of possible extended use and the limitations of these lubricants were pointed out. In conclusion, Codding said, 'extreme pressure lubricants provide a safety factor against lubrication failure and their use in many installations is insurance against unnecessary interruption of operations.'

The many questions raised were answered by Lee Ballard, Colonel, U. S. Army Reserve, also of the Tide Water Associated Oil Company."

Meetings:

MARCH 28

Speaker: O. L. Maag, Chief Lubrication Engineer, Timken Roller Bearing Co. Subject: Lubricants for Anti-Friction Bearing Application (illustrated with slides).

APRIL 25

J. R. McPhee, Ironsides Co., nationally known for his collegiate football officiating, will present motion pictures and point out the highlights of the important football games of 1949. (This is a joint meeting with the Cleveland Section.)

MAY 23

Bosses Night. Speaker: C. E. Pritchard, Chief Lubrication Engineer, Republic Steel Corp. Subject: The Lubrication Engineer's Contribution to Maintenance.

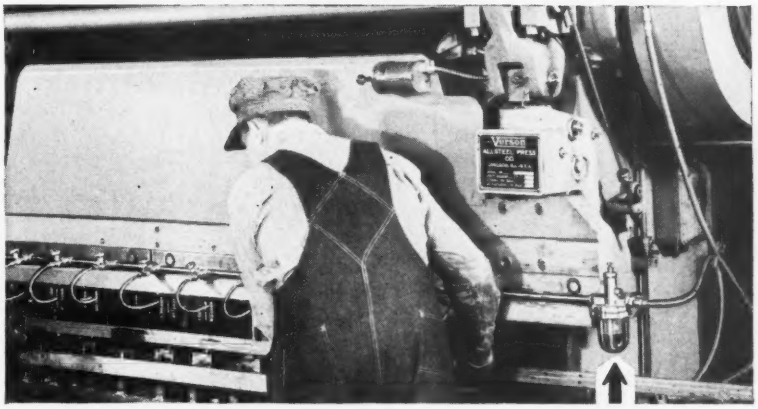
JUNE

Annual Golf Party. (Joint meeting with the Cleveland Section.)

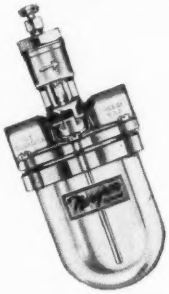
CLEVELAND

Secretary Riss is another alert reporter of digests of papers presented before his Section, giving our readers valuable information. We quote:

"The February meeting of this section featured a discussion on 'Geophysical Prospecting for Oil' by Dr. Sigmund Hammer of the Gulf Research & Development Company, Pittsburgh, Pennsylvania.



AUTOMATIC Lubrication Boosts Punch Press Output 30%



Output jumped 30% on this machine when, on advice of the Norgren representative, The Sunlight Metal Products Corp. of Denver installed a NORGREN LUBRICATOR and a simple distribution system that oiled every punch and stripper automatically with *every stroke.* Increased life of the punches 50%!

Previously, punches were oiled by hand by brush every 10 punches.

NORGREN LUBRICATORS Are 'way Out Front!

- **Automatic—no attention except refilling.**
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- **Visible oil feed.**
- **Assure oil feed the instant air flow starts.**
- **Accurate, needle-valve control of oil flow.**
- **Compact; easy to install; stop oil waste.**

Use Norgren aerosol lubrication on all machines operated wholly or in part by air. Write C. A. Norgren Co., 234 Santa Fe Drive, Denver 9, Colo.

Norgren

Also Filters, Regulators, Valves, Hose Assemblies.

The history of oil finding and development of the need for scientific prospecting methods were reviewed briefly. Geophysical prospecting is a new science which utilizes the methods of physics in measurements on the surface of the ground to give geological information about hidden rocks deep in the earth where oil is found. The principal modern geophysical methods and instruments were described, and results which have led to the discovery of important oil fields were shown. The odds for success or failure in drilling a wildcat well and the effectiveness of geophysical prospecting were also discussed. Finally, a general picture of present oil reserves and the outlook for the future were considered.

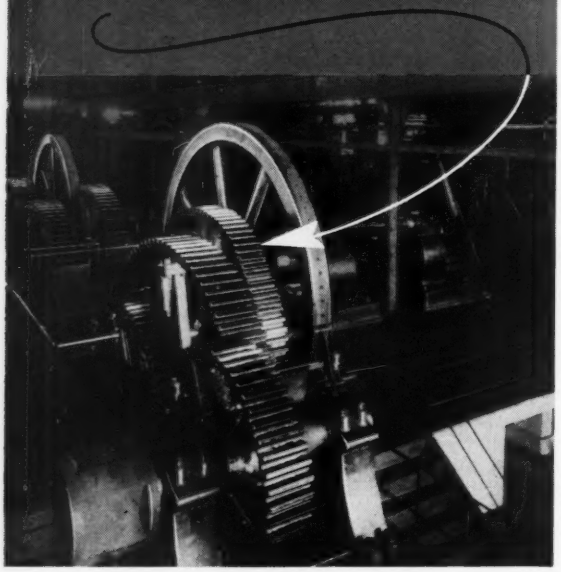
* * *

A presentation by Mr. John Simonds of Vickers, Inc., Detroit, Michigan, based upon experiences in handling field problems which are affected by hydraulic oils was the subject of the March meeting. Included in his talk, Mr. Simonds featured a film used by the armed forces in training programs for enlisted men. In addition to this worthwhile film, the comments contributed by Mr. Simonds made this a highly instructive and entertaining meeting."

Let us show you how

LUBRICATION COSTS CAN BE CUT

on equipment like this



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for Fuel and Lubricating Oil Filters

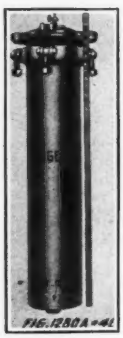
THE widespread use of NUGENT Absorbent Type Fuel and Lubricating Oil Filters is indicative of how the industry is conserving lubricating and fuel oils.

Figs. 1280 A 4L and 1280 AU 4L4, show two sizes of THE IMPROVED NUGENT DEPTH TYPE PRESSURE FILTER. These types are equipped with one to 12 standard filter cartridges in a single container or shell of various sizes, depending upon the filtering capacity required. All cartridges are alike and interchangeable regardless of whether they are the Repackable type or the Replaceable ("THROWAY") type. Both types are made for capacities from 1 up to 2248 H.P. in single containers or shells. (Navy specifications.)

This largest size contains only 12 recharges and filters a total of 182½ GPM lubricating oil. Compare this with other makes of filters containing 35 to 40 small recharges that must be stocked and handled each time you clean the filter.

NUGENT Fuel Oil Filters are made for Diesel engines from 1 to 384,000 H.P. in single containers.

Arrangement of 4 cartridges in 1 shell. Larger size shells are made to contain 3 to 12 cartridges.



(Above) A Nugent Filter shell containing one cartridge.

(Above) Replaceable "THROWAY" type recharge.

NOTE THESE SUPERIOR NUGENT FEATURES:

- Easy and neat piping because inlet and outlet openings are opposite, close to the bottom.
- Filters have built-in by-passes—will take full flow or by-pass filtering.
- Drain plugs. Air vented.
- Reduces the neutralization number of lubricating oil from 0.40 to 0.04.
- Very inexpensive "THROWAY" Replaceable cartridges.
- Absorbs moisture four times its own weight.
- Traps abrasives such as gritty carbon, dust or metal particles.
- Safety: Patented construction prevents rupture and by-passing; all materials in elements harmless to engine; leaves the additives unchanged in modern compounded lubricating oil.
- Free flow: Entire outside surface filters oil. The patented center strainer core maintains free flow of the filtered oil and will not collapse nor by-pass under extreme pressure.
- Efficiency: Minute openings narrow toward the center; stop large particles first, small ones later, distributing dirt evenly through the element.
- Longer life because of larger filtering area.

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Oil Filters, Oiling and Filtering Systems, Telescopic Oilers, Oiling Devices, Sight Feed Valves, Flow Indicators . . . *Representatives in Principal Cities*

In this plant Honan-Crane Purifiers are direct connected to twenty-four 1,000 HP Cooper-Bessemers; nineteen 1,000 HP Worthingtons and eleven 1,450 Rathburn Jones engines... a total of 68,950 HP.

Honan-Crane Purifiers are available with both single and multiple cartridge-type, quick-change refills . . . using either cellulose fiber, or fullers earth purifying media.

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Proven Design Increases Safe-Use Life of Oil... Cuts Maintenance Costs

Honan-Crane Oil Purifiers are the choice of leading Diesel operators and engineers for purification of lubrication oils in Diesel Engines.

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For complete information (or, a Honan-Crane resident engineer will call at your request) . . . write to Honan-Crane, 818 Wabash Avenue, Lebanon, Ind.

HONAN-CRANE CORP., Lebanon, Indiana
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Poem

It is seldom that LUBRICATION ENGINEERING presents poetry on its pages but it takes the exceptions to prove the rule. Colonel F. L. Gray of Chicago brought this anonymous poem to our attention. Depending on the reader, it can be considered in either a light or serious vein, but its message could well be taken to heart by more than one member.

DO YOU JUST BELONG?

Are you an active member,
  The kind that would be missed,
Or are you just contented
  That your name is on the list?

Do you attend the meetings
  And mingle with the crowd,
Or do you stay at home
  And crab both long and loud?

Do you ever go to visit
  A member who is sick,
Or leave this work for just a few
  And talk about the clique?

There is quite a program scheduled
  That means success, if done,
And it can be accomplished
  With the help of everyone.

Think this over, Member,
  Are we right or are we wrong?
Are you an Active Member?
  Or—Do you Just Belong?

—Unknown

"Catsup ON YOUR ICE CREAM?"

Just because you used catsup on your steak, the waiter shouldn't assume you use it on the rest of your dinner too!

And just because one bearing is best lubricated by one particular grade of oil, you shouldn't assume that the same oil is best for *all* bearings on that machine. In many cases it isn't.

OIL CUPS permit you to lubricate each bearing with the oil best suited to that bearing—thus prolonging bearing life, reducing maintenance costs, cutting down-time, boosting production. And oil cups fortunately *cost very little.*

Gits oil cups have been the standard for industry for more than 40 years. Gits Bros. has the largest selection of oil cups available anywhere. Call on Gits Bros. for a prompt, efficient solution to your lubrication problems.

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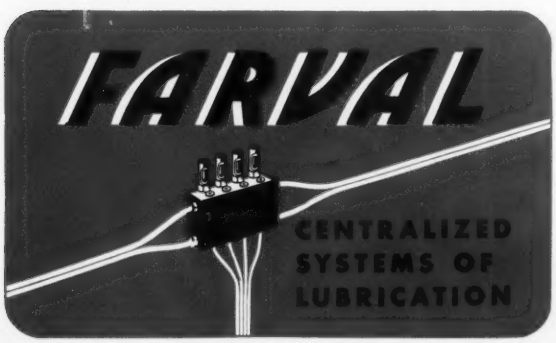

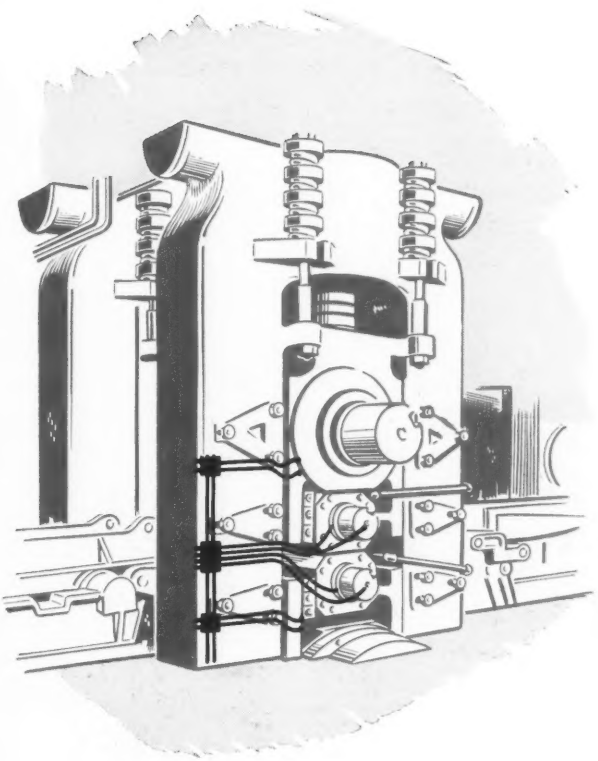

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